THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LIII. No. 1340.] LONDON, JANUARY 15, 1889. [41ST YEAR. Price 6d.

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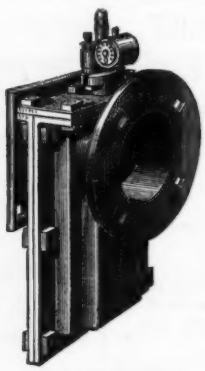

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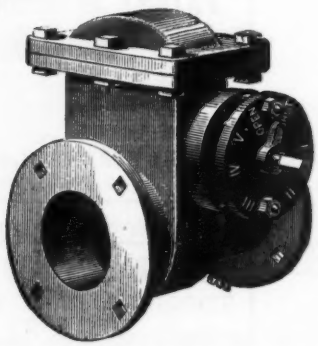

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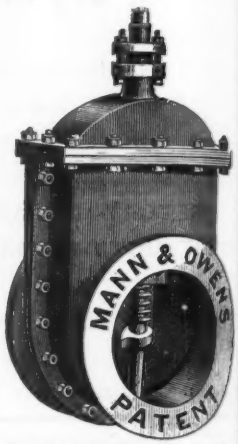

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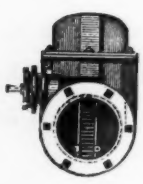

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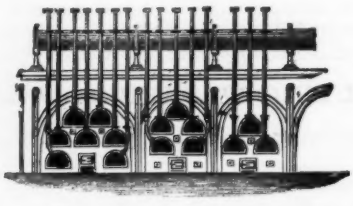

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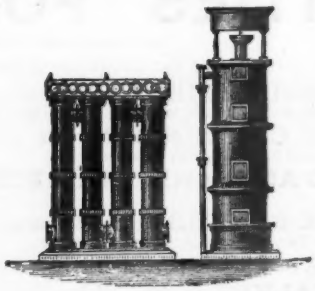

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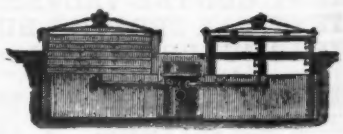

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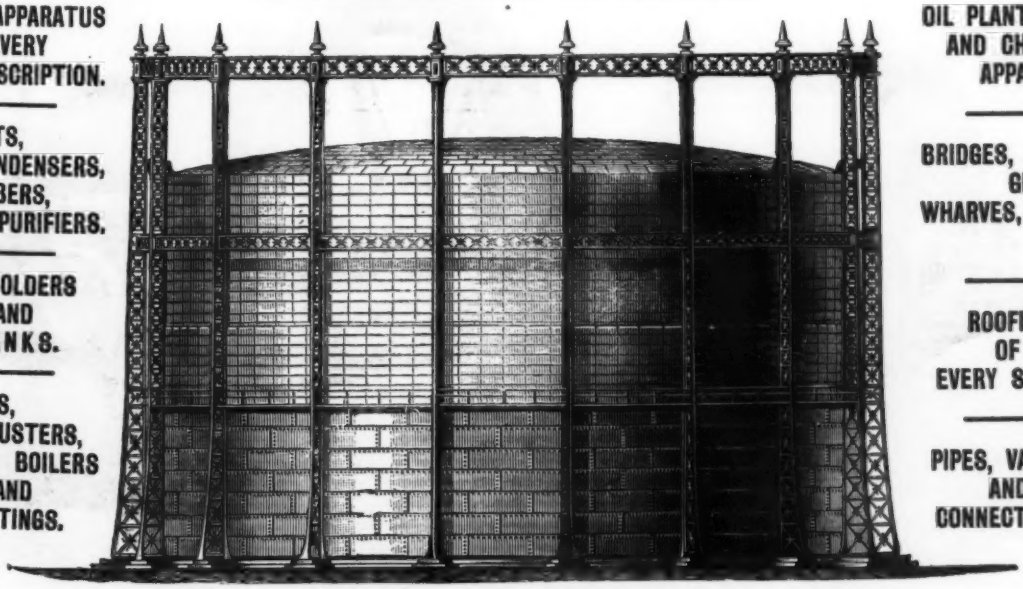

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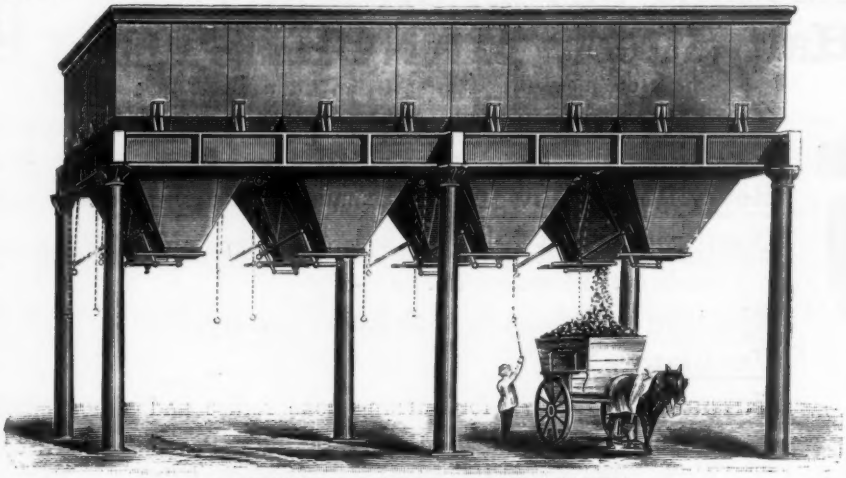

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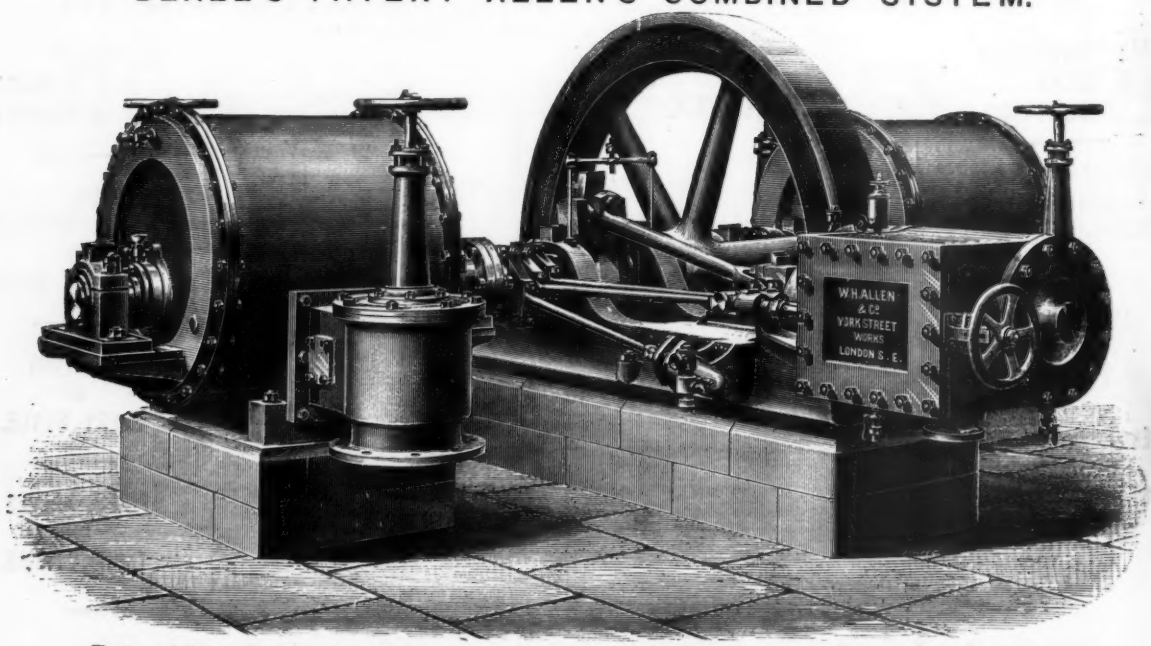

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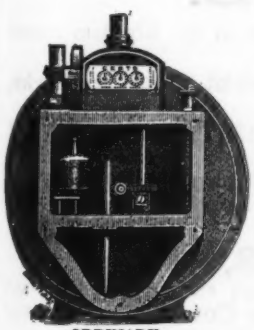
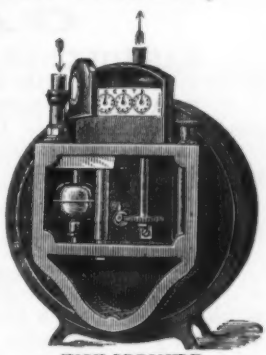


ORDINARY.



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G. R. HISLOP'S PATENT REGENERATIVE PROCESS

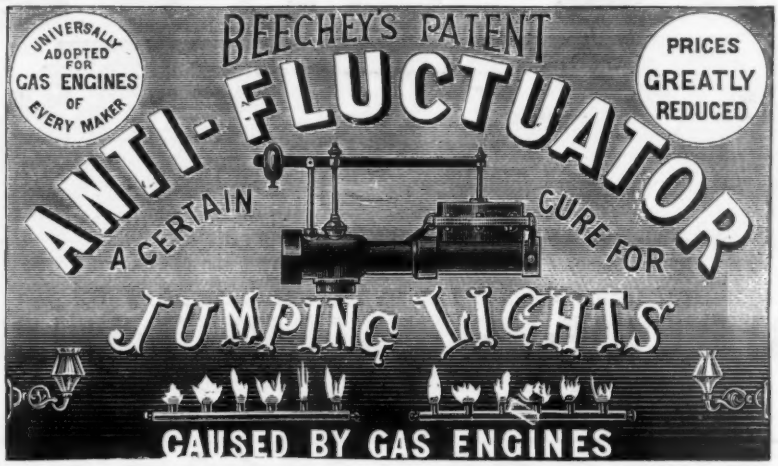
MOST EFFECTIVELY AND *ECONOMICALLY RESTORES* LIME WASTES CONTINUOUSLY.

The Patentee having under his several Patents effected a complete solution of the Spent Lime difficulty, most confidently solicits the consideration of the fact by the Engineers and Managers of Gas Companies, Gas Corporations, and other Spent Lime producers. The adoption of these Patents secures the following amongst other advantages, viz.:—1st. Nuisance is avoided, and the utmost convenience and comfort in Gas purification are secured. 2nd. The Lime is recovered at from one-third to one-half the cost of new Lime, or from 5s. 6d. to 7s. 6d. per Ton (depending on extent of works and working charges). 3rd. The Lime is either recovered for Building and Agricultural purposes, or specially and continuously for Gas purification—no limit being assigned to its durability. 4th. Nearly the whole of the valuable sulphur is collected and sold. 5th. By the Patentee's Improved Furnace, breeze or inferior cannel coke only is required as a fuel. The process has been worked for a considerable time by several important Gas Companies and Corporations throughout the Kingdom, and with the most satisfactory results. The Patentee erects, proves, and grants working on very moderate terms.

Further particulars may be had on application to A. F. WILSON, Esq., Assoc. M. Inst. C.E., 12, Walbrook, London, E.C., Agent for London; J. E. FISHER, Esq., Stourbridge, Agent for the rest of England, Wales, and Ireland; or to the Patentee—

GEO. R. HISLOP, Engineer, GAS-WORKS, PAISLEY, N.B.

Price Lists AND Full Particulars On Application to W. PARKINSON & CO., Gas Engineers, Cottage Lane Works, CITY ROAD, LONDON, E.C.



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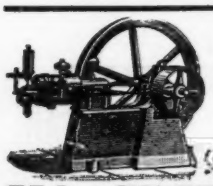

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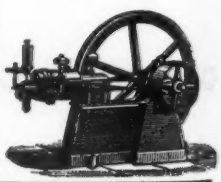

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which have acquired a high reputation for the **excellence** of Materials and Workmanship; their **durability** and **accuracy** of **Register** guaranteed. They are used by several of the **London Gas Companies,** and over **200 Provincial Gas Companies.**

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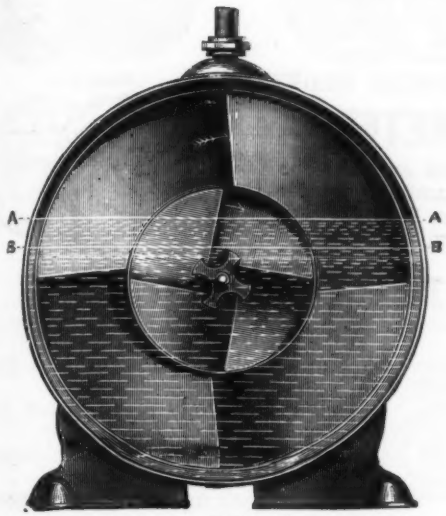
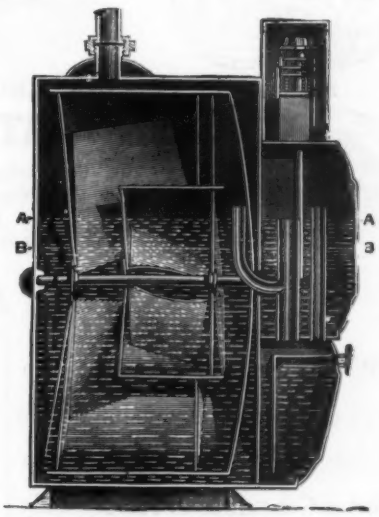
THE WARNER AND COWAN METER.



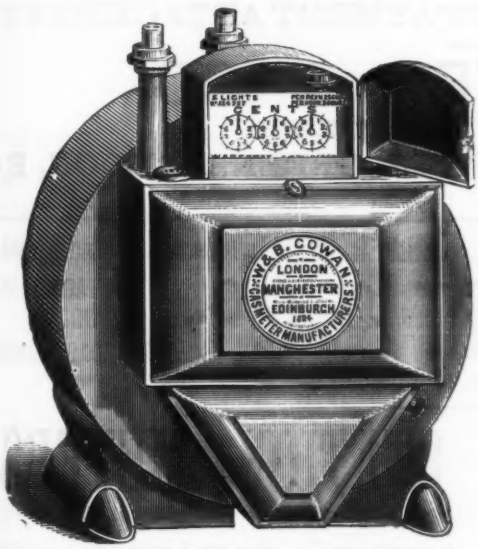
A A, High-Water Line.

B B, Low-Water Line



Drum in Case. Hollow Cover removed.

Sectional Side View of Meter.



Elevation showing Tin Case Meter.

Elevation showing Cast-Iron Case Meter.

In its completeness as a measure, the WARNER AND COWAN drum differs from every other. Of definite capacity, irrespective of the water-line, it can neither be over nor under filled, but discharges at each revolution the same volume of gas.

It is to this also that its secondary, though important, advantage is due—viz., the long float-range which this drum permits.

The illustrations show front and side views of the drum, and also views of the complete meter—both in tin and cast-iron case.

The drum being of fixed capacity within itself, the extraneous mechanism and arrangements are of the most simple character. These include all that is necessary, but exclude all that would be superfluous.

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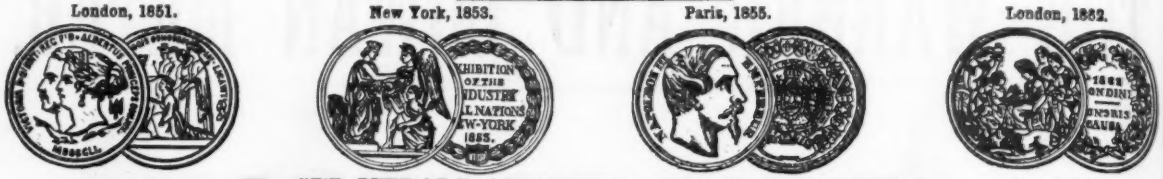
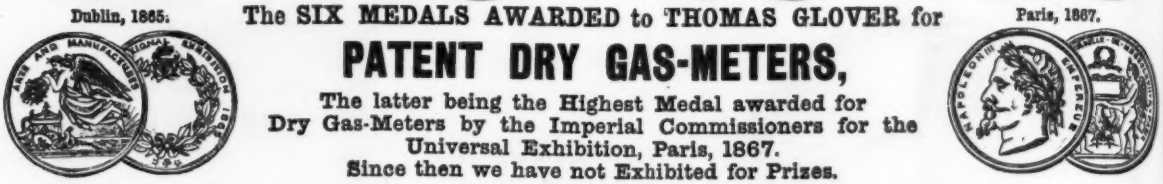


Dublin, 1865. Paris, 1867.



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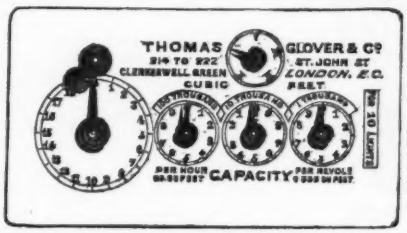
PATENT DRY GAS-METERS,

The latter being the Highest Medal awarded for Dry Gas-Meters by the Imperial Commissioners for the Universal Exhibition, Paris, 1867.
Since then we have not Exhibited for Prizes.

PREPAYMENT METERS.

By setting the Hand of the large Circle on the left-hand side of the Dial, Gas Companies can allow a Consumer to receive only



the exact amount of Gas they have received prepayment for, and thus avoid the unpleasantness of asking users for a deposit.

ALSO MAKERS OF BROWNHILL'S PREPAYMENT ATTACHMENTS.

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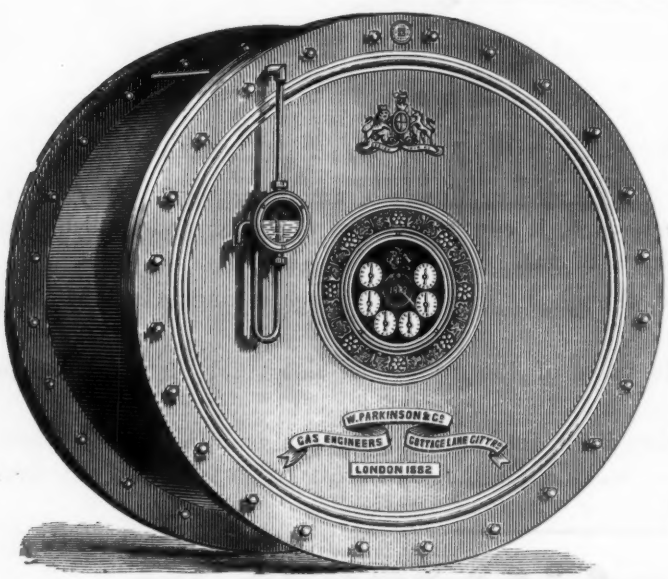

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[See also Advt., p. 140.

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THE JOURNAL OF GAS LIGHTING,
WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, JANUARY 15, 1889.

A SCHEME FOR INCREASING THE CONSUMPTION OF GAS.

THE communication from Mr. W. A. Valon, of Ramsgate, which we publish to-day is worthy of particular notice from all gas managers desirous of increasing the consumption of their staple product. Mr. Valon is labouring at the same problem that has attracted and puzzled many others before him—that of introducing gas into houses where provision has not been made for it—and it is a promising omen for the eventual disposal of the difficulty that every fresh attempt in this direction is bolder and broader than its predecessors. We are not aware that any gas manager has hitherto gone so far as Mr. Valon in recommending that gas suppliers should fit up houses for consumers free of cost; and the enterprising Ramsgate Engineer deserves all the credit that will accrue to him if his Committee follow his advice, and succeed in attaining the desired object. The statistics given by Mr. Valon respecting the houses of his town which do and do not take the Corporation gas, may be compared with the similar returns collected by Mr. Thomas Moore, of Macclesfield, and others. They open the question of the comparative field presented by different towns for such operations as that which Mr. Valon has in view. It will be observed that Mr. Valon has discovered 1000 houses to work upon—that is to say, nearly 50 per cent. upon the houses actually supplied—without descending into the class of cottage property. It will probably be correct to lay down the general rule that such a state of things is only to be met with, in England, in old and residential towns. It reveals a very different condition of affairs to that which prevails in young manufacturing towns, where the problem of increasing the consumption of gas is simply the difficulty of dealing with the cottage population, whose demands, according to one way of thinking, are too insignificant to be worth the risk of supplying. In such a case as that stated by Mr. Valon, however, where there are in a given district nearly 50 per cent. of the houses with rentals averaging from £15 to £30 which are not supplied with gas, the desirability of making an effort to secure this eligible class of business is not disputable. The question naturally arises, how it is that so many of a respectable class of houses are yet without gas; and we believe that the question is to be variously answered. It is the same in the older parts of London, where streets and rows of houses let out as lodgings, or occupied for semi-private businesses not requiring shops, are innocent of gas. Gas is, in fact, an innovation to the old-fashioned residents in many of these domiciles; and the number of truly antiquated people who live secluded lives in the dingy shabby-genteel parts of London would not be credited by a stranger to these dull districts. Again, nearly all of this class of houses are rented by yearly tenants who depend upon sub-letting portions of them for paying the rent; and the financial arrangements of landlords, tenants, and lodgers are so nicely balanced that it is worth nobody's while to go to a few pounds of expense for laying on the gas. The landlord does not see that it is any business of his, even if he can afford it. The tenant really lives in two or three rooms—rent free if the lodgings are regularly let—and leads a too generally hand-to-mouth existence to undertake the expense of gas-fitting. As for the lodgers, of course anything of this kind is out of their interest altogether. This picture applies to thousands of houses in London, and has many close parallels, if not absolute copies, in all old residential towns.

It is through this crust of indifference, the growth of years, that Mr. Valon would attempt to pierce. It is the interest of the gas manufacturer, if of anybody, to make gas easily available for a class of householders who, for the reasons just described or for others, have been as rigidly shut out from the privilege of gas-light as though the main, instead of passing their doors, were miles away. Habit, convention, and circumstances have disabled these people from enjoying one of the great conveniences of town residence; and they will remain in this helpless condition until somebody from the gas-works breaks the spell. It is scarcely to be expected that progress in extending the use of gas among these benighted householders will be rapid at first, even with all the facilities offered by Mr. Valon. It will take years to bring a proper sense of such a change of circumstances in regard to lighting home to the appreciation of people who have always looked at gas afar off, as not for them. Advertisement will only catch a few of the more enterprising; and notices issued from the gas office will be regarded with more or less suspicion. Many householders will doubtless, however, avail themselves of the opportunity for doing what adverse conditions have alone hindered in the past; and their report will spread among friends and acquaintances similarly situated.

We are glad that Mr. Valon has mentioned the system of collection of gas-rents upon inspection of the meter. This is the practice in Scotland, where gas is very much more popular—in the sense of being widely used by all classes of

the community—than in what is supposed to be the wealthier South. Indeed, it would be permissible to go farther, and describe it as the village system everywhere. In many small undertakings it would not pay to make two calls for the gas-rental; and therefore the manager or a clerk goes round on fixed dates to take the registers of the meters, and he receives payment on the spot. This arrangement goes a long way towards meeting the difficulty of compulsory credit. Mr. Valon's scheme does not at present embrace the artizan cottagers of the district; and he does not therefore require a prepayment meter. Possibly this may be the next novelty introduced to the consumers of Ramsgate. For the present, however, the Ramsgate Gas Committee will probably be content to watch the results of the first step, if they should agree with the recommendations of their Engineer, which is more than likely.

It is to be hoped that Mr. Valon's request for information as to the working of similar schemes in different parts of the country will meet with a satisfactory response. In this, as in so many other technical matters, the last word upon the subject is much more difficult to get than the first. One repeatedly hears of people who are intending to do this or that, or whose experiments in a certain direction are announced as promising; and then the whole thing is dropped. Many gas managers have declared their adhesion to the principle of the new departure contemplated by Mr. Valon; but particulars of the working out of schemes are by no means ready to hand when called for. Of course, it may be difficult to bring forward data bearing upon the Ramsgate project, for the reason that the character of the district is peculiar. On the other hand, what succeeds at Ramsgate need not necessarily, and would not in fact be very likely to succeed in a different district. Making due allowances for this consideration, however, there must be in existence a good deal of information respecting the general subject which might with great advantage be published at the present time. This topic may be taken in the broadest possible manner, to include all recent attempts on the part of gas manufacturers to remove restrictions to the use of, or to increase the popular demand for, their commodity. For example, the relinquishment of an irritating formality handed down from prehistoric times, or the removal of the gas offices from an inaccessible hole to a prominent position in the town, are measures distinctly calculated to increase the popularity of gas; although it might be difficult to appraise them in a definite percentage of increased consumption. There are other ameliorations, the influence of which is more clearly defined; and these are well worth following up not merely when they are first started, but afterwards. What is wanted is for every man who commences such a new practice in his business as is worth talking about at all, to make a mental resolution to tell how it has worked after the lapse of two, three, or five years. Experience of human nature shows, however, that only successful experiments are likely to be chronicled in this way; for it is not in most men to draw attention to their mistakes and failures, which are things we all try to bury in oblivion. Let us hope that the result of Mr. Valon's inquiry may be the evoking of a good body of data tending to elucidate this interesting question. It is not so much opinions that are required, as facts.

THE PARLIAMENTARY RETURNS.

The Parliamentary Returns relating to authorized gas undertakings for the year ending March last in the case of works belonging to Local Authorities, and December, 1887, in the case of Gas Companies, have just been issued. Late as these papers are ordinarily, they are very behindhand this time, for some reason which will not be likely to come out. The delay robs the returns of a good deal of their interest as news, although, of course, their statistical value remains. The particulars of the returns may be taken as having attained their ultimate form after repeated amendments and amplifications, and appear now to be complete. The returns are bulkier, especially that relating to Gas Companies, owing to the progress of statutory incorporation of new and old limited Companies. The number of Companies now included in the return is 384, which is an increase of 32 since the year 1882, when the return was first obtained. The number of Local Authorities returned as owning gas undertakings is 168, or a growth of 20 since 1882. The total number of authorized gas undertakings in the United Kingdom embraced in both returns is therefore 552, representing a gross authorized capital of £74,289,595, of which £57,478,015 is paid up or borrowed. By the employment of this capital, £14,928,616 was earned in 1887 for an expenditure upon revenue account of £10,304,687. The weight of coal and cannel carbonized was 8,962,831 tons, producing 91,371,513,000 cubic feet of gas, of which 83,658,691,000 cubic feet were sold. The ascertained length of gas-mains was 20,113 miles, serving 2,163,258 consumers and 423,580 public lamps. The progress shown in the comparative tables of annual totals since 1882—the year, be it remembered, of the passing of the Electric Lighting Act, and of the greatest development of the electric light mania—is satisfactory. The Gas Companies have employed £4,461,645 more capital; and the Local Authorities, £2,755,252 more. Altogether, therefore, £7,216,897 of fresh capital has gone into gas in Great Britain since electric lighting first became the hope of the future. This demand for additional capital means a greater call for gas than ever; for whereas in 1882 the total weight of coal carbonized was 7,280,757 tons, this consumption had grown to 8,962,831 tons in 1887, or an increase of 1,682,074 tons carbonized for the additional money. The number of consumers also rose during the five years from 1,971,971 to 2,163,258; and the number of public lamps lighted from 361,311 to 423,580. This record of profitable progress is eminently satisfactory, taking all the circumstances into account.

THE DISPUTE RESPECTING THE GAS SUPPLY OF DUBLIN.

The dispute between the Dublin Corporation and the Gas Company is no nearer to a settlement, notwithstanding the remarkable proceedings in the City Council which will be found reported on another page. It will be remembered that the last "upset" between the Corporation and the Gas Company was respecting the deficient illuminating power of the gas as reported by the public Inspector, who was notoriously appointed for the purpose of plaguing the Company. Mr. W. F. Cotton, on behalf of the Company, denied the imputed shortcoming, and challenged the Corporation, if they had faith in their own officer, to sue them according to the statute for the damage alleged to be incurred. To this apparently straightforward challenge, the Corporation have demurred, on the extraordinary plea of want of confidence in the tribunal named in the Act for dealing with this class of offences. That is to say, they decline to trust to a Police Court, the tribunal to which the London and all other Gas Companies in the kingdom are subject in these matters; thus setting their own opinion of the fitness of things above that of the Legislature. Of course, the Inspector and the Law Agent of the Corporation took this view. It would probably be bad for their own interests if they did not The most remarkable feature of the proceedings of the Corporation in this affair is that, while refusing to follow the Act in one place, they pounce upon that provision of it which directs that disputes between a Gas Company and a Local Authority shall be referred to arbitration, and offer to meet the Company in this way. A more transparent "shuffle" was never executed. We doubt if the law warrants the extension of such a proceeding as arbitration to cover distinct offences, for dealing with which a regular mode of procedure is assigned; and we moreover venture to think that if this is so, and the result of an arbitration should be contrary to their aims, the Corporation of Dublin would be the first to take advantage of this quibble for upsetting the whole thing. The Company have themselves offered arbitration as a means of settling their differences with the Corporation; but if we remember aright, this offer had reference to other matters than alleged deficiencies of illuminating power. The Corporation declined the offer when it was made; but are inclined to accept it now when something else can be bundled up with it. The conduct of the matter is referred to a Special Sub-Committee of the Paving and Lighting Committee—a selection so questionable in many respects that one of the members of the Corporation has expressed his determination not to sign any of their cheques. Yet for all this, it would not be surprising if the Gas Company were to accept the offer of arbitration. Knowing the men he has to deal with, Mr. Cotton would be sure to see that the terms of the reference should be such as would be required for satisfactorily binding such slippery customers; but this very care might break off the negotiations at any stage. The Corporation would incessantly try to put the Company under some disadvantage, which the Company would naturally resist, and do their best in their own interests. A deadlock, half-a-dozen times riveted, might easily mark the course of such negotiations; and thereupon the Corporation (who would desire nothing better) would go their way asserting that all their

well-meant attempts to meet the Company amicably had failed, owing to the duplicity of the latter. It is a pleasant state of affairs for all parties concerned.

THE COUNTY COUNCIL NOMINATIONS.

The nominations for the election of County Councillors took place last week; and the contests will probably be something of an event in most parts of the country. We have already remarked upon the prospect that the general character of the Councils will be upheld in many counties by the election of the same class of gentlemen who as justices have hitherto exercised administrative as well as judicial functions. Scarcely anywhere is there such a crowd of candidates for the new dignity as in London, where all the divisions except one will be contested, generally by seven or eight rivals for the two seats. Many of the candidates are personages of some distinction and fighting ability; the candidature of the Earl of Rosebery, for example, being as aggressive as many a parliamentary contest. Some of these noblemen in search of employment must feel a novel excitement in thus for the first time in their lives taking part in a properly contested election. For the rest, over a score of members of the Metropolitan Board of Works, including, unfortunately, some of the most notorious hacks of that discredited organization, are seeking to once more have a finger in that Municipal pie from which some of them are shrewdly suspected of having drawn many plums. Then there are many of the order of Metropolitan, Middlesex, and Surrey unpaid officialdom—members of the Asylums and School Boards, Guardians, Justices of the Peace, &c. The balance is made up of more or less worthy people—some gentlemen, some very much otherwise—who hope to get seats in the general scramble among applicants for the most part utterly unknown to the electors. Political machinery has been utilized to bring the names of some of the candidates before the ratepayers; the district party organizations all having their pet men. The methods of appealing to the electors by circular (which is the most general mode; few of them being disposed to attend public meetings) are as diverse as the individualities from which these communications emanate. Some are commanding; some apologetic. Some give long statements of policy; others merely tell who the candidates and their backers are, leaving the electors to trust wholly to character and recommendation. Among the subjects discussed in these productions are the gas and water supply; but it is generally recognized that the powers of the new Councils in respect of these matters will not at first be great. The idea is they should be enlarged, however; and it is an accepted "plank" in the "platform" of the "advanced" candidates for certain districts that "gas and water supply, instead of "being monopolies worked for private profit, should be made "to contribute to the public funds." Birmingham, that Mecca of a certain school of politicians, is evidently the source whence this inspiration is derived. It must not be thought that opinion upon these subjects is at all clearly defined as between political candidates of different colours. The righteousness of the Coal Dues and of taxing gas for the benefit of the rates are matters respecting which the most inglorious confusion prevails among men of all parties. As, fortunately, there will not be any immediate call for a decision upon these puzzling questions, the holding of muddled views concerning them is not necessarily a proof that a candidate is unfit to be a County Councillor. There will be plenty of time to straighten these issues out before they will come up for settlement by the new authorities.

Mr. G. W. Stevenson.—The many friends of this gentleman' whose serious illness was notified in our columns a few months since, will be pleased to learn that he has made a wonderful recovery towards restoration to health, after the doctors had definitely given up all hope. So far there has not been the slightest drawback to his convalescence; and he is in full expectation of resuming his consulting practice after Midsummer—that is, before the work for next year's parliamentary session commences.

Presentation to Mr. R. Brown, of Hastings.—The officers and *employés* of the Hastings and St. Leonards Gas Company, on the occasion of the marriage of Mr. R. Brown, one of the assistants of the Engineer (Mr. C. E. Botley, Assoc. M. Inst. C.E.), took advantage of the event to present him with a handsome marble dining-room clock and a pair of bronze ornaments to match. There were in all 147 subscribers, in whose presence the presentation was made on Saturday, the 5th inst., in the Board-room at the works. The inscription on the plate attached to the clock was as follows:—"Presented to Richard Brown, by the Officers and *Employés* of the Hastings and St. Leonards Gas Company, on the occasion of his marriage, Jan. 8, 1889."

Water and Sanitary Affairs.

In his report on the Metropolitan Water Supply for November, issued last week, General A. de Courcy Scott states that "the filters of the Southwark and Vauxhall Company at "Hampton are in an unsatisfactory condition." The Company appear to be aware of the fact, and have intended for some months past to have the filters thoroughly cleansed. General Scott states that this operation should now be taken in hand with the least possible delay. It is the special duty of General Scott, as the Metropolitan Water Examiner, to ascertain from time to time whether the Companies have complied with the requirements of section 4 of the Metropolis Water Act of 1852, and to report the results of his several examinations to the Local Government Board. The Act requires that every Company shall effectually filter all water supplied by them within the Metropolis for domestic use, before the same passes into the pipes for distribution, excepting any water which may be pumped from wells into a covered reservoir or aqueduct, without exposure to the atmosphere, and which shall not be afterwards mixed with unfiltered water. If filters are not duly cleansed from time to time, it is obvious that they are likely to become loaded with suspended matters derived from the river water, and will consequently fail to fulfil the purpose for which they were designed. To see that the law is duly observed in this particular is the very *raison d'être* of General Scott's appointment; and we may expect that the defect which he has pointed out in reference to the Southwark Company's filter-beds will be speedily remedied. But there is another question, about which it is conceivable that some dispute may arise. The Company are described as "extending their works for flood-"ing the natural beds of Thames ballast, and collecting the "water therefrom." It is further stated that "a proportion "of the water" thus obtained is at present pumped direct into the trunk main, and sent on to Nunhead for distribution. It thus escapes passing through the artificial filters; whereas General Scott considers that the flooding and collecting works should be regarded merely as substitutes for the settling reservoirs, and that all the water for the supply of London "derived from this portion of the Thames" should be filtered in due course, like any other part of the supply. It might be wise for the Company to adopt this course, for which they have an example in the Grand Junction Company, whose works are close at hand. But so far as the incidence of the law is concerned, a little depends on the proper designation for what is being done. General Scott speaks of "flooding and collecting." The Company might reply that what they were doing was practically pumping from wells into a covered aqueduct, so as to bring their operation under the exception granted in the Act of 1852, The Company possibly consider that the water is filtered as it passes through the gravel beds, and that nothing more is needed, so long as the water is protected from subsequent deterioration. Whether the Company use this argument, we do not know; but at all events they seem to be acting upon it, although the Grand Junction Company submit to the conclusion arrived at by General Scott. The "proof of the "pudding is in the eating;" and we should like to know what is the actual condition of the water as it comes from the gravel beds. The worst we can expect of it is that it will be found to contain some inert mineral matter, as harmless as the chalk in the deep-well water of the Kent Company. If the elimination of this mechanical admixture is thought desirable, we may presume that the Southwark Company will yield the point, though in years gone by, the water from the gravel beds would have been accepted, *minus* filtration, as a very admirable drinking supply. Provincial water supplies are frequently turbid from the presence of earthy matter; but people are assured that the water is perfectly wholesome, in the same way as the supply from Loch Katrine is approved, although occasionally "light brown in colour," and marked by the presence of a "little suspended matter." As the Southwark and Vauxhall Company are now raising £100,000 of fresh capital, giving them a margin of £20,000 over their present deficit, we may conclude that they will neglect no measure which can conduce to the purity of their supply. At the same time, every possible encouragement ought to be given to a Company in seeking to utilize the underground waters, in preference to drawing from the open stream.

Essays, Commentaries, and Reviews.

THE AFFAIRS OF THE GAS INSTITUTE.

We have received several communications relating to the position of The Gas Institute, in addition to those published in our "Correspondence" column to-day—to which we will refer first. The statement of Mr. Durkin, of Southampton, while it clearly shows that nobody on or out of the fragmentary Council of the Institute has a right to pledge the Committee and members of the South-West Association to any particular line of action in the present emergency, also indicates scarcely less clearly that Mr. Garnett's proceedings are not generally approved in his own neighbourhood.* It might have been supposed that some apology, or at least explanation, would have been offered on the part of the members of the Council to Mr. James Stelfox and the members as a body, in respect of their unwarranted use of his name. Nothing of the kind has come to hand, however, up to the time of going to press. Neither has Mr. Garnett seen fit to reply to Mr. Woodall's strictures upon his change of front, or to explain his assumption of the sham presidency. The letter of Mr. Samuel Hayward does not amount to much. It is doubtless very kind of him to shed the light of his wisdom and impartiality upon the matters at issue between the parties to whose opposition the existing state of things is due. Most of Mr. Hayward's observations and arguments have, however, a second-hand look. The attempt to mix up the question of commissions with the troubles of the Institute, as we have occasion to remark elsewhere, is a piece of mistaken cunning. The gentlemen who have quitted the Institute have no reason to fear comparisons in point of honesty and disinterestedness, even when made according to Mr. Hayward's lofty standard, with those who have remained behind; but in reality the two orders of subjects have no such connection as Mr. Hayward and Mr. Bray seek to create.

One of our correspondents points out that, as there is no power in the Institute rules for dealing with vacancies in the governing body, the strictness with which the vote of last June upon the application of rule 25 was dealt with by the Court, should inspire caution in the present emergency, when the governing body of 24 has been reduced to 6. His argument is capable of being summed up as follows: If a vote of a two-thirds majority of a meeting was illegal owing to informality, how can any proceedings of only one-fourth of the normal number of the Council be good in law? He further shows, by an illustration drawn from the law and practice of gas and other trading companies, that means are always provided for preventing the usurpation of absolute power by a mere quorum of the Board. He evidently thinks that anybody disposed to be troublesome could in this way upset any act of the fragmentary Council, and continues: "Under these circumstances, it would be but an act of prudence on the part of the subscribers to consider whether the Council as at present constituted sufficiently represents the Institute to solicit subscriptions on their behalf; and even if so, whether it would be wise to comply with their request, while matters remain in their present unsettled state." This correspondent evidently regards the Institute as, to all intents and purposes, defunct.

We understand that the Committee of the Midland Association of Gas Managers have met, and recorded their satisfaction with the course pursued by Messrs. Colson, Peaty, and Cross, members of the Association, who have resigned their seats on the Council of The Gas Institute. After hearing the explanations tendered by these gentlemen, the Committee framed a resolution not to continue to subscribe to the Institute, which we believe has been, or is to be, submitted to the members of the Association. It is understood that the late members of the Council of the Institute will meet shortly to concert measures for the formation of a new organization, one of the fundamental principles of which will be the exclusion of the trading element.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 130.)

Having stood at 5 per cent. for rather more than a quarter of a year (since the 4th of October, 1888) the Bank rate of discount was lowered on Thursday to 4 per cent. The ease of the Money Market has had its effect in the Stock Exchange; and a good deal of business has been done by way of investment in choice securities. The Funds have been exceptionally high; and the attainment of "par" by the 2¾ per cents. is being looked for. The more speculative markets—those which are the most susceptible of fluctuation—have not been particularly animated. The general rise in the Gas department which characterized the preceding week, has been continued and intensified in the week just closed. This is owing to a variety of causes. In the first place, after a period of depression, there always comes a reaction. Then, the foggy and frosty weather we have lately had so much of, makes good business for the Gas Companies. And, finally, the caution exhibited by the public authorities in declining to scatter Licences broadcast among the numerous electric-lighting adventurers who are rushing to the front, has given a check to rampant speculation in electric schemes. The chief advances in value have been made by the Metropolitan Companies; Gaslight "A" being at the head with a rise of 6½. On Friday it was done at 260¾, the highest mark of the week. South Metropolitan has been exceedingly quiet; one transaction in "A" being all the business marked in the week. But both "A" and "B" are quoted 3 higher. Commercial old was done once at 262; but the new was not touched. Each stock is 3 higher. It may be noted that their quotations are very discrepant. To place the old stock on a fair level with the new (and they rank together for dividend), the old stock ought to be at least 12 higher. This, moreover, would be about the level of the other two Metropolitan Companies' stocks. The Suburban and Provincial undertakings offer nothing to remark upon; but the Foreign category have been active, and some of them very buoyant. Conspicuous advances in price have been made by Continental Unions; and Imperial Continental has added another 3 to its gain of the previous week. The only retrograde movement was in Bombay, which failed to maintain the ¼ it had gained. The Water Companies exhibit their usual degree of quietude; but they are a little stronger throughout, and the debenture stocks notably have advanced in value.

The daily operations were: Gas business on Monday was moderate, and fairly distributed through the list. Gaslight "A" rose 1½. Water was quite stagnant. Tuesday's business in Gas was rather quieter, and was mostly among the foreigners. Bombay fell ¼. Water was hardly touched. Gas was about the same on Wednesday in point of activity, but showed more strength. Gaslight "A" advanced 1½; and South Metropolitan "A," 1. In Water, East London and Southwark ordinary were 1 higher each. Business in Gas was larger on Thursday, and prices still moved upwards. There was an advance of 2 in Gaslight "A," South Metropolitan "B," and both the Commercials; 1½ in Imperial Continental; and 1 in Continental Union fully paid. Water presented no feature. On Friday, Gas was a little quieter; but further advances were widely made. South Metropolitan "A" rose 2; the "B," 1; Gaslight "A" and Imperial Continental, 1½ each; and both Commercials and all three Continental Unions, 1 each. Water was decidedly brisker, and quotations rose. Southwark ordinary rose 1; ditto 7½ per cents., 2; and New River debenture, 1. On Saturday, Gas was quiet and firm, without alteration. Water continued active; and a rise of 1 was marked in Chelsea and in Lambeth debenture.

ELECTRIC LIGHTING MEMORANDA.

THE DIVISION IN THE METROPOLITAN ELECTRIC LIGHTING INTEREST—THE FORTUNES OF THE MAXIM-WESTON COMPANY—THE CONDITIONS FOR ELECTRIC LIGHTING IN THE CITY OF LONDON.

The skirmish between Mr. Robert Hammond and the representatives of the big electrical companies that have applied for Provisional Orders covering the whole of London has been briskly carried on during the past week. We recognized in our last comments upon the subject that Mr. Hammond had found a weak place in the imposing schemes of his rivals; and these have confessed as much by the quickness and shrillness of their outcries. "Who are you that you should have the right of lighting all London for 42 years?" says Mr. Hammond to the London Electric Supply Corporation and the Metropolitan Electric Supply Company; "why, you have never yet lighted a single house through underground wires and under statutory conditions." And although they gird at him, his opponents cannot deny the truth of the imputation. That the weakness thus exposed is a serious matter is further shown by the following remarks of the American *Electrical World* upon the Deptford undertaking of the London Electric Supply Company. "We cannot but view with combined admiration and apprehension—admiration for the boldness; and apprehension for the success of—the employment of a potential of 10,000 volts, with one side of the circuit bare and exposed to ground contacts at innumerable points, in fact designedly grounded. This means an absolute insulation at every point in the circuit; and whether, in the light of past experience, even with currents of far less tension, such a state of affairs is a practical possibility remains to be seen. In fact, we can here only re-echo the statement of one of our foreign contemporaries, which remarks that this project must either be a gigantic success or a gigantic failure." *The Times* thinks that Mr. Hammond has given his pretentious rivals a hard nut to crack; and this impression is not removed by anything they have had to say in defence. The purpose which Mr. Hammond evidently desired to serve has been secured; and the public mind has been diverted with salutary effect from contemplation of the great promises of the new electric lighting speculations to the very slight foundations upon which these pretensions are raised. It would not be surprising if the Board of Trade found a way to defer the permanent authorization of any of these London electric lighting schemes until the promoters can prove their ability to perform the engagements to the public which they appear so desirous of undertaking.

An extraordinary meeting of the Maxim-Weston Company has been held for the purpose of confirming the resolutions agreed to at the extraordinary general meeting on Dec. 21 with regard to the reconstitution of the Company. The present Directors are anxious to carry out the reconstruction; but the partizans of the former Chairman, Mr. Hugh Watt, who is accused of having brought the Company into the present deplorable condition, have been trying to prevent it, by persuading the shareholders that they will get more by dissenting. It was pointed out from the chair that the only alternative to reconstruction is liquidation, in which event the proprietors would only get about 2d. or 3d. per share. In the end the policy of the Board prevailed; and so the Maxim-

* After the portion of the Journal containing the "Correspondence" columns were at press, a telegram was received from Mr. Durkin, asking that the letter here referred to should not be published, as an explanation had been received by him. It was, however, too late to comply with his request.

DRAWING Nº 7

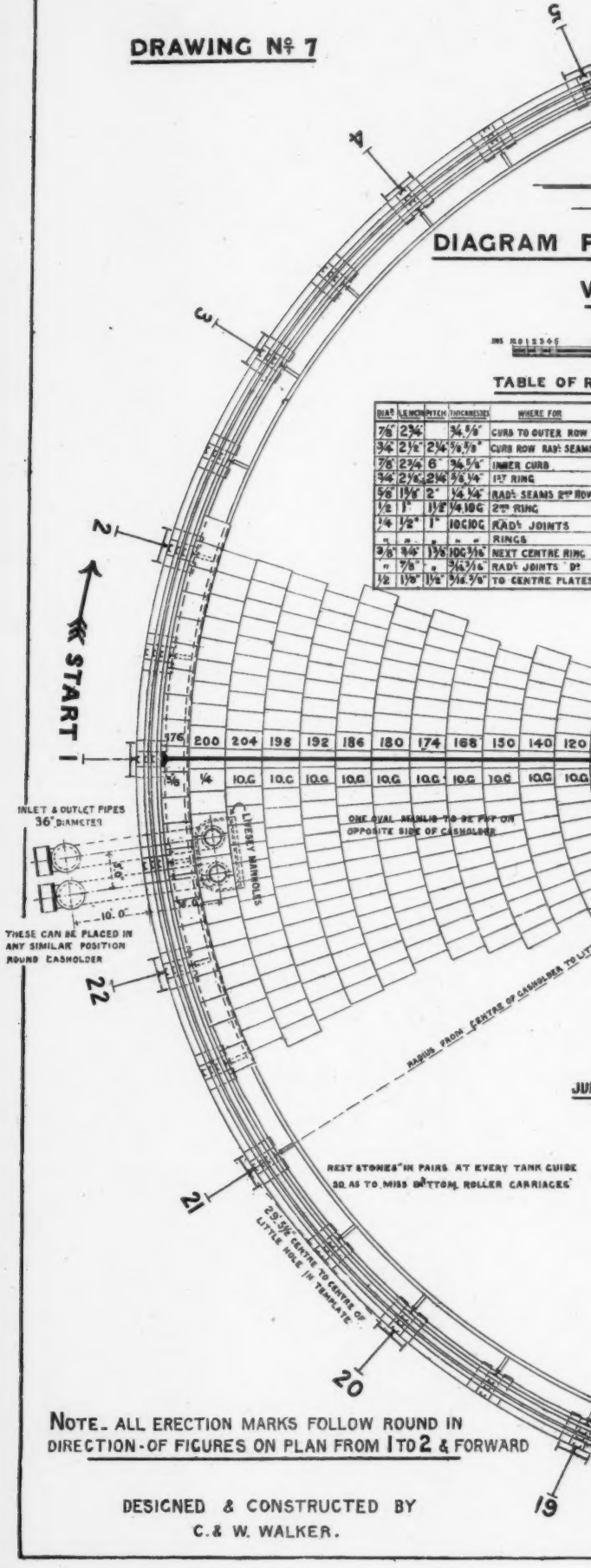


DIAGRAM F
V
TABLE OF R
DIAM LENGTH PITCH THICKNESSES WHERE FOR
7/8" 2¾" ¾ 5/16" CURB TO OUTER ROW
¾ 2⅛" 2¼" 5/16" CURB ROW RADL SEAMS
7/8 2¾ 6" ¾ 5/16" INNER CURB
¾ 2⅛ 2¼ 5/16 ¼" 1ST RING
⅝ 1⅜ 2" ¼ ¼" RADL SEAMS 2ND ROW
½ 1" 1½" ¼ 10G 2ND RING
¼ ½" 1" 10G 10G RADL JOINTS
" " " " " RINGS
⅜ ¾" 1⅜ 10G 3/16" NEXT CENTRE RING
" ⅞" " ¾ 3/16" RADL JOINTS "D"
½ 1⅜" 1½" ¼ 5/16" TO CENTRE PLATES
START 1
2
3
4
5
176 200 204 198 192 186 180 174 168 150 140 120
¼ 10G 10G 10G 10G 10G 10G 10G 10G 10G 10G
INLET & OUTLET PIPES 36" DIAMETER
THESE CAN BE PLACED IN ANY SIMILAR POSITION ROUND GASHOLDER
LIVERY MANHOLES
ONE OVAL MANHOLE TO BE PUT ON OPPOSITE SIDE OF GASHOLDER
5'0"
10'0"
RADIUS FROM CENTRE OF GASHOLDER TO LI
JU
REST STONES IN PAIRS AT EVERY TANK GUIDE SO AS TO MISS BOTTOM ROLLER CARRIAGES
29'5½" CENTRE TO CENTRE OF LITTLE HOLE IN TEMPLATE
19
20
21
22

NOTE- ALL ERECTION MARKS FOLLOW ROUND IN DIRECTION-OF FIGURES ON PLAN FROM 1 TO 2 & FORWARD

DESIGNED & CONSTRUCTED BY
C.& W. WALKER.

SYDNEY GASHOLDER

GRAM PLAN OF GASHOLDER & TANK, SHEWING REST STONES,

VERTICAL GUIDES, TIMBER FRAMING, &c &c

SCALE OF FEET

INS 0 1 2 3 4 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100 FEET

TABLE OF RIVETTING THROUGH TOP

	WHERE FOR	LENGTH	THICKNESSES	WHERE FOR	LENGTH	THICKNESSES	WHERE FOR
	CURB TO OUTER ROW	3½"	⅜,⅜,⅞	AT J^TS OF PLATES	3¾"	⅜,⅜,⅝	AT J^T COVERS
	CURB ROW RAD^L SEAMS						
	INNER CURB	3¾	⅜,⅞,⅜	JOINT COVERS	3"	¾,⅜	VERT^L J^T CURB
	1^ST RING	2⅞	⅜,⅜,¼	JOINTERS	2½"	⅜,⅜,¼	JOINTERS
	RAD^L SEAMS 2^ND ROW	1¾	¼,⅜,10G	,,			
	2^ND RING				1⅛"	⅜,10G,10G	JOINTERS
	RAD^L JOINTS						
	RINGS	¾"	10G,10G,10G	JOINTERS			
	NEXT CENTRE RING	1"	⅜,⅜,10G	,,	⅞"	⅜,10G,10G	JOINTERS
	RAD^L JOINTS 'D^T						
	TO CENTRE PLATES	1⅜"	⅜,⅜,⅜	JOINTERS			

ELEVATION OF BRACING TO OUTER CIRCLE

ELEVATION OF BRACING CIRCLE A

150 140 120 105 91 84 70 56 42 28 16

10G 10G 10G 10G 10G 10G 10G 10G 10G 10G ⅜

105'6"

JUNCTION AT OUTER CIRCLE OF POLES

QUARTER PLAN OF TIMBER FRAMING

8'-3" 8'-3" 8'-3" 9'-3" 8'-3" 8'-3" 11'-3" 11'-3" 9'-3"

A

VERY TANK GUIDE
LER CARRIAGES

WARD

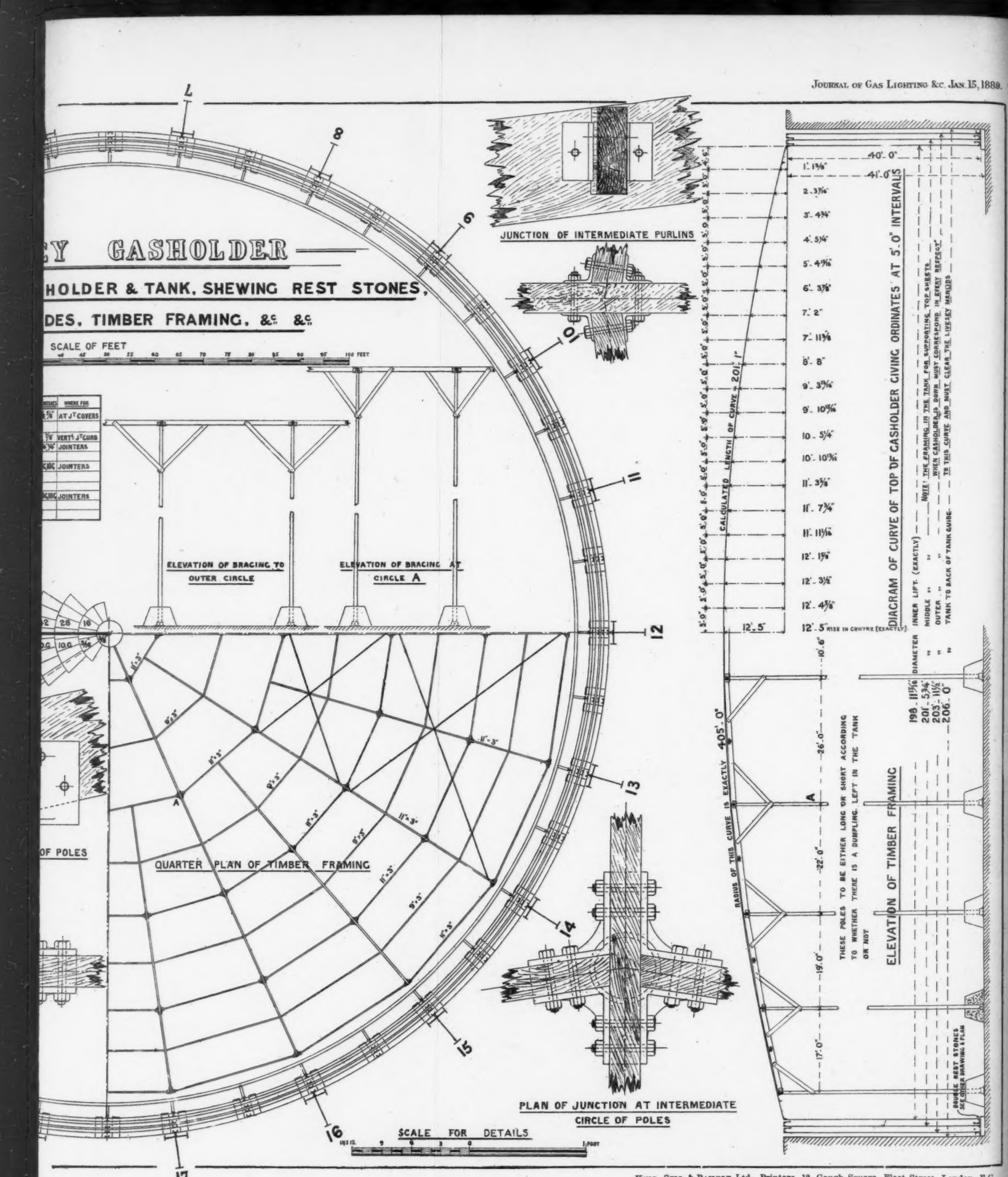
19 18 17 16

SCALE

...EY GASHOLDER

...HOLDER & TANK, SHEWING REST STONES,

...DES, TIMBER FRAMING, &c. &c.


SCALE OF FEET
ELEVATION OF BRACING TO OUTER CIRCLE
ELEVATION OF BRACING AT CIRCLE A
QUARTER PLAN OF TIMBER FRAMING
JUNCTION OF INTERMEDIATE PURLINS
PLAN OF JUNCTION AT INTERMEDIATE CIRCLE OF POLES
DIAGRAM OF CURVE OF TOP OF GASHOLDER GIVING ORDINATES AT 5'.0" INTERVALS
CALCULATED LENGTH OF CURVE = 201'.1"
RADIUS OF THIS CURVE IS EXACTLY 405'.0"
ELEVATION OF TIMBER FRAMING
THESE POLES TO BE EITHER LONG OR SHORT ACCORDING TO WHETHER THERE IS A DUMPLING, LEFT IN THE TANK OR NOT
SCALE FOR DETAILS
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17

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Weston business is to be carried on by a rejuvenated Company; who may, with good management, yet succeed in picking up some of the orders that now go to the Brush and other concerns of the same class. The Maxim-Weston have always been a trouble to the Brush Company, whom they have prevented from getting their own way, and securing fat "jobs" on several occasions. It will be well for the public if they survive to do the same again.

The Commissioners of Sewers of the City of London are still hankering after electric lighting for the streets, and have recently received a report from their Engineer, Lieut.-Col. Haywood, and Consulting Electrician, Mr. W. H. Preece. Mr. Preece's advice does not amount to much, as may be understood from his observation that he has shown that incandescent lamps are the best for street lighting. He admits that he would prefer to string such lamps over the centre of the highway; but reluctantly confesses that consideration of the need for keeping a clear thoroughfare for fire-escapes prevents the carrying out of his notions in this respect. Colonel Haywood's observations are much more to the point. He puts it bluntly to the Commission that they "ought to be off with the old love before they are on with the new"—that before going in extensively for any scheme of electric lighting, they should make up their minds whether to abandon gas or not. This is sensible advice; for the old arrangement whereby the deficiencies of the electric lamps were made good by falling back upon gas was eminently unsatisfactory to all. Moreover, the Engineer shows that he is not forgetful of the "spotty" effect of arc lamps strung at long intervals along the sides of thoroughfares, and reminds the Commission that equable diffusion of light is preferable to alternations of strong glare and darkness, which electricians profess to regard as the acme of street lighting. The *Electrical Review* strongly endorses this declaration in favour of gas for street lighting, by remarking that it cannot recall any interruption of the City street lighting by gas for the past 20 years, and concludes a really remarkably candid criticism of the report as follows:—"Private consumers are naturally at liberty to adopt what kind of lighting they choose; but it is a matter of the highest importance that the streets shall be lighted by that medium which gives the least chance of extinction from any cause whatsoever." At last, therefore, the old mistake of regarding electric lighting as peculiarly applicable for streets and open spaces, while gas is better for interiors, which has done duty in many a directorial speech, inaugural address, and after-dinner oration, is discredited even from the electricians' side. In point of fact, the truth lies directly the other way. Electric lighting is hopelessly bad for streets, because arc lamps are as much too brilliant for real requirements—we are not speaking of promenades—as incandescent lamps are too feeble; and both are too expensive. If economy is studied in the use of arc lamps, they must be spaced so widely that the effect is "spotty;" and the cost of incandescent lamps renders their use quite impossible in the profusion which would be required for producing a good effect. For interiors, on the other hand, those who like to pay for it can doubtless get a pretty light by means of electricity; but they must not be too particular as to steadiness and reliability at all times, and must understand that the cost of their toy will be at least three or four times that of good gas lighting.

Mr. Ellis Lever and the Leeds Gas Coal Contracts.—Since our report on this matter (pp. 124-5) was in type, we learn that—alluding to comments on his last letter in one of the local papers—Mr. Ellis Lever yesterday telegraphed to the Town Clerk of Leeds as follows, from the Hotel Victoria, London:—"Editors of *Leeds Mercury* assert in Saturday's issue that I may be quite certain the Corporation would see that all reasonable facilities were afforded me of proving my statements. That is all I have asked for in a friendly spirit, and with no personal motive, but solely on public grounds."

Death of Mr. W. Phillips, J.P., of Luton.—It is with much regret that we have to record the death, last Thursday of Mr. W. Phillips, J.P., of Luton. About the 18th of June last, Mr. Phillips was taken seriously ill; and since then to the time of his demise, he has been under medical care. The deceased gentleman took a lively interest in local affairs, and was much respected throughout the town and district. To our readers, however, he is better known by his long association with the Luton Gas Company, as Consulting Engineer to many of the gas-works in that district, and as a Director of the Tuscan Gas Company. Mr. Phillips was appointed Manager of the first-named Company as far back as Aug. 20, 1844, up to which time the experience of the Company had not been of the brightest. Under Mr. Phillips's management, the concern has considerably developed. The original capital (£25,000) has been multiplied more than ten-fold; the works are the most extensive and perfect in the district; while in respect to quality and price, the gas will compare well with that supplied by other Companies in the locality. It may be mentioned that four of Mr. Phillips's sons are connected with the gas industry. Mr. W. R. Phillips has been for some time the Engineer of the Luton Gas Company, and holds a similar position with the Luton Water Company. As Engineer to the Tuscan Gas Company Mr. A. F. Phillips holds an important office; and he is also Manager of the St. Albans Gas Company. Mr. E. Phillips is Manager at High Wycombe; and Mr. C. E. Phillips has been associated with his father and elder brother in the work of the Luton Gas Company. Much sympathy is expressed with the family of the deceased gentleman, who completed his 81st birthday on Nov. 9 last.

THREE-LIFT HOLDER FOR SYDNEY GAS-WORKS.

Designed and Constructed by Messrs. C. & W. Walker, of London and Donnington.

DESCRIPTION OF DRAWING, No. 7.

It will be seen that a portion of the top sheeting only is given in this drawing, as it would be mere repetition to show the entire crown. The sheets are arranged radially in rings; each ring being 5 feet wide centre to centre of rivets. The width of the sheets on the wide end is from 2 ft. 6 in. to 2 ft. 9 in. centre to centre of rivets. All the sheets are made from a regular set of templates, which apply to all gasholders whatever be their diameter. Messrs. Walker construct all their gasholders to one curve for the top, which is an arc of a circle 405 feet radius. The top sheets of their holders are thus always segments of a sphere 810 feet diameter; and no matter how small or how large the diameter of the holder may be, there is precisely the *same* strain on the sheeting per lineal foot of joint, providing the gasholder gives the same pressure, because the tensile strain on the segment of a sphere is equal to that on the whole sphere of which it is a part. The only thing that need vary, therefore, is the thickness of the sheeting, which, as far as the actual strain is concerned, should vary exactly as the pressure. For small gasholders (under 40 or 50 feet diameter), the rise would be so shallow, that it is usual to give them a greater rise than this curve provides—for the sake of appearance, as well as to reduce the strain on the top curb. The old rule of 5 per cent. or one-twentieth of the diameter for the rise, is altogether wrong; because for large gasholders it is not sufficient, and for small ones it is too much. There is no reason whatever for its use. In the holder under consideration, the rise is 12 ft. 5 in. But by the old rule, it would have been only 10 feet; and as the strain on the sheeting varies almost inversely as the rise, the strain on the sheeting would have been increased about 20 per cent. As constructed, the strength of the sheets at the rivetted joints, as well as that of the rivets themselves, is well within the margin of safety.

The arc of the top is shown on the drawing, and the lengths of the ordinates at 5 feet intervals is given for convenience of setting out in the shop.

The drawing also shows the numbers and thickness of the sheets in each row. The numbers are exact; "closers" are unnecessary, as the sheets come together exactly—the number of rivet-holes in each circle being made to coincide with the row next adjoining. The centre sheet is shown stronger than the rest. As far as strength is concerned, it would do just as well the same thickness as the rest; but it has become a custom to make this centre plate thicker, and the custom has been followed. The outer row of all is $\frac{5}{8}$ inch thick, and forms part of the top curb (for which see drawing No. 8 to follow). The next row also assists the top curb somewhat, and is $\frac{1}{2}$ inch thick. Even if this thickness were not necessary to meet the strains, it would be essential for other reasons—viz., that it is not possible to join a thin sheet to a thick plate ($\frac{5}{8}$ inch), so as to make a satisfactory gas-tight job, and of uniform strength with the rest of the work. Large rivets have to be used, because of the $\frac{5}{8}$-inch plate; and, consequently, the holes cut away the thin sheets, and are too far apart. Small rivets close together are wanted for the thin sheets; but they could not be used, as they would not be suitable for the thick plate. It is, therefore, necessary to reduce the thickness from the thick plate *gradually;* so that the size of the rivets may be reduced gradually, and the joints made properly. Another reason for the gradual reduction is that all the *spring* of the top does not come at one place. When the top of a holder is inflated, and the pressure increases, the thin sheets rise, and stretch somewhat beyond the curve they were made to. The stiff curb plate will not rise much, but the sheeting beyond will; and if it be connected direct to the curb plate, the rise and fall will work the joint injuriously. But if a *gradual* reduction is made in the thickness, the joints will not only be sounder and stronger, but the alteration in form will be *gradual* instead of *sudden*.

The black line down the centre of the sheeting denotes the "starting mark." This occurs opposite No. 1 column or standard. Everything starts from here—top sheeting, side sheeting, curbs, cups, guide-framing, &c.—all being made to work round in the direction of the numbers shown on the plan; and the various pieces are marked according to the bays to which they belong. This, it is evident, is a very particular part of the work when a job has to be erected in a foreign land, so that no trouble may arise in fitting things together on the spot.

A table giving the size, length, and pitch of rivets to be used, according to the various thicknesses to be passed through, is given on the drawing. This is a most useful table; there being no trouble to determine either the size of rivets to be used for any particular place, or to decide where the rivets sent are intended for. The plan of circle also shows the positions of the 22 standards. They are all placed to the exact calculated distance apart centre to centre shown on the drawing. Templates of the base are provided for building the holding-down bolts in correctly to suit; and through these templates a very small hole is put in the front, corresponding with the "little hole in template" referred to on the drawing. It is to this the distance centre to centre is given. The rest-stones are in pairs, so as to clear the channel-iron guides and cup rollers in the gasholder, which project below the cups and bottom curb. The positions of the tank-guides, channel-iron guides in the outer and middle lifts, vertical stays to the inner lift, and brackets to the top curb are clearly indicated on this drawing, and require no further explanation. The diameters of

the various lifts, as already stated, have been made to agree with the exact circumferences needed to suit the proper pitches of rivetting round the holder.

The top sheets of the holder are supported on a wood framework similar to that shown on the drawing. It was constructed by the Australian Gas Company themselves, and consists of a series of poles with cast-iron shoes and caps standing upright in the tank; the bottom being surrounded with a block of concrete just to add weight to *prevent floatation*. On the top of the poles, and attached to them by means of the caps, is a system of wooden rafters and purlins curved to the dome of the gasholder. The whole structure is braced and strutted both vertically and horizontally, to keep it from racking out of shape.

GAS BILLS FOR 1889.

According to annual custom, we herewith proceed to give abstracts of the Bills relating to gas supply which will engage the attention of Parliament during next session. It has already been remarked that the amount of this class of private Bill business is small this year; and none of the applications possesses the general interest arising out of the suggestion of any new principle in gas legislation.

The Faversham Gas Bill is to obtain statutory powers for the Faversham Gas Company, Limited, who were constituted under a Memorandum of Association in 1888 for the purpose of acquiring certain gas-works and property at Faversham, in Kent. The Company purchased the works in question, and are now supplying gas in their district, having a paid up capital of £26,880 in £8 shares, all issued to the proprietors of the old Company in payment for the property transferred. The capital of the statutory Company is to be £40,000, consisting of the original capital already appropriated, and £13,120 of new stock. Power is also sought for the borrowing of £6720 in respect of the old capital and £3280 upon new stock. The Company's district is defined; and the standard price of 15-candle gas is to be 4s. 3d. per 1000 cubic feet when supplied within a radius of 2200 yards from the centre of the existing works, and 4s. 9d. beyond. The Great Wigston Gas Bill is to incorporate a limited Company formed in 1857 for supplying gas to the village of Great Wigston, Leicestershire. The present share capital of the Company consists of £14,000, with £2000 borrowed on mortgage. The capital of the Company is to be £24,000, whereof £10,000 is to be new capital; with power to borrow £3500 upon the old and one-fourth part of the new capital as raised. The standard price for 15-candle gas is to be 3s. 9d. per 1000 cubic feet. A clause is inserted allowing the Company to grant discount not exceeding 10 per cent. for cash or large consumption. The Woodhall Spa Bill is to incorporate a Company for the supply of gas and water in the district named, which is situated in the Parts of Lindsey, in Lincolnshire, and is a growing health resort. The capital of the Company is to be £25,000, whereof £10,000 is to be the gas capital, with the addition of £2500 by borrowing. Fifteen-candle gas is to be supplied at the maximum price of 6s. per 1000 cubic feet.

The Morley Gas Bill is to enable the Company to raise £40,000 additional capital, with power to borrow one-fourth of the amount as raised. Fourteen-candle gas is to be supplied. Where the Company deem it necessary to do so, they seek power to require payment in advance for supplies demanded for eight months or any shorter period. They also desire to be enabled to supply electric lighting. The time for allowances in respect of defective regisration of consumers' meters is to be restricted to the current half year. The Tuscan Gas Company, Limited, have a Bill for enlarging their powers. The Company was originally formed in 1876 for supplying gas in Tuscany; and was authorized by a decree of his late Majesty King Victor Emmanuel to carry on their business in the Kingdom of Italy. The preamble recites that the objects for which the Company was founded have been attained, and that it is now expedient that their name should be changed, and that they should as from the present time be authorized to carry on business outside the Kingdom of Italy, supplying also electric light and water wherever desirable. The West Ham Gas Bill is to empower the Company to raise £250,000 of new capital on which a standard £10 dividend is to be payable. It is required that shares purchased at auction shall be paid for within one month. The initial price for 16-candle gas is stated at 3s. 3d. per 1000 cubic feet. Borrowing powers are sought for to the extent of one-third of the paid-up capital, to be raised only as debenture stock. The testing place for the Company's gas is to be at the Town Hall of West Ham or an approved place in lieu thereof. The provisions respecting powers of amalgamation with other Companies, mentioned in the notice of this Bill, do not appear in it as printed. The Windermere District Gas and Water Bill is to enable the Company to raise £17,500 of additional gas capital, and to borrow one-fourth the amount paid up, in addition to £3125 to be borrowed on the security of capital authorized by an Act of 1862. The Burnley Corporation Bill contains a part relating to gas and water. The limits of supply are extended, and made co-extensive with the limits of the extended borough. The statutory powers of the Padiham Local Board for the supply of the township of Habergham-Eaves are repealed; and additional gas lands are to be taken. The sum of £30,000 is to be borrowed for gas-works purposes, to be repaid within 30 years.

As relating to lighting, the Bill of the Metropolitan Electric Supply Company, Limited, may be mentioned here. It is for authorizing the Company to erect and maintain electric lights and works, and to supply electricity within the parishes of Saint James, Westminster, and Saint-Martin-in-the-Fields, Middlesex, and certain other parts of the Metropolis, particularly the Victoria Embankment and Waterloo Bridge. The undertakers bind themselves not to acquire or unite with any other electric lighting undertaking in the district without the previous consent of the local authority. Within six months from the passing of the Act, and before commencing any work, the undertakers are to satisfy the Board of Trade as to their financial strength for discharging the duties laid upon them by the Act. There are provisions for the protection of the public and local authorities and the owners of property interfered with by the Company's operations, with particular reference to gas and water mains. The conditions under which the undertakers may be required to lay their mains in any part of their district are set out, as also the terms and duties of electric inspectors to be appointed by the local authority. Owners and occupiers of premises situated within 50 yards from any electric main may require to be supplied on paying for all but the first 30 feet of the service wire, and agreeing to take the supply for three years and pay for the same, at least as much as 20 per cent. per annum on the outlay of the undertakers for their special supply. A penalty of 40s. for every default in supply is to be incurred by the undertakers, with the provision that these penalties shall never amount to more than £100 in any one day. The supply may be charged for either by meter or on any agreed rental system. The charge for supplies to private consumers by meter is to be £3 10s. for any quantity up to 100 units, and 7d. per unit beyond.

Institution of Civil Engineers.—At last Tuesday's meeting of the Institution of Civil Engineers, held under the presidency of Sir George B. Bruce, the second ballot of members for the current session took place, when among the 33 associate members elected were Mr. John Ferguson Bell, of the Stafford Corporation Gas-Works, and Mr. Dugald Clerk, of Birmingham.

The Supply of Water within the Glasgow Corporation Boundaries.—In a Glasgow evening paper, a correspondent directs attention to the fact that the weight of water annually distributed by the Corporation mains to the city and surrounding district amounts to about five times the total weight of all goods and minerals introduced to the same area by railways and shipping. It is computed that about 40 million gallons of water are passed through the mains daily. This gives in weight nearly 180,000 tons per diem, or almost 66 millon tons per annum; while the total weight of goods of all descriptions sent into the city and suburbs, in the same period, is (roughly) something more than 13 million tons. These figures give some idea of the unequalled water resources of the Scotch commercial capital, and of the enormous demand made on it for domestic and manufacturing purposes.

Death of Mr. James Muir.—On Wednesday last, the remains of the late Mr. James Muir, M. Inst. C.E., Engineer to the New River Company, were interred at Kensal Green Cemetery. There was a large attendance, including Directors, officers, and servants of the Company, and many others who had been professionally associated with him. Mr. Muir first became connected with the New River Company in the year 1841, and was appointed Engineer in 1859. Having fallen into ill-health, he was, in the year 1882, relieved from active duty, and accepted the position of Consulting Engineer. In the succeeding year, he was elected a Director of the Company, and has since then been unremitting in his attendance at the Board meetings, until about six months ago, when he was seized with the illness which, after a long and painful course, terminated in his death on the 4th inst. During the long period of his connection with the Company, he was ceaseless in his exertions to maintain at the highest pitch of excellence every detail that might contribute towards maintaining the purity of the water, or the efficiency of the supply. The deceased gentleman was as well known for his kindly and gentle disposition as for his great firmness and love of discipline. His judgment was much esteemed by those who were professionally associated with him; whilst his courteous manner, and ever-ready advice, made him respected and trusted by all who knew him. Mr. Muir was in his 72nd year.

The Debentures of the Metropolitan Gas Company of Melbourne.—The tenders for the Metropolitan Gas Company of Melbourne 4½ per cent. loan (to which reference was made in a previous number of the Journal, p. 64) were opened on Tuesday at the Commercial Bank of Australia. They amounted to £228,200, at prices ranging from the minimum of £105 to £109. Tenders at £106 16s. 6d. will receive about 31 per cent. of the amount applied for, and those above that price in full. The average price obtained for the loan was £107 1s. 10d. A few figures regarding the progress of the Company during the past decade will be interesting. The steady increase in the revenue is very marked; and last year's income was more than double what it was in 1878. In that year the revenue was £215,632; in 1879, £223,172; in 1880, £284,558; in 1881, £244,819; in 1882, £270,960; in 1883, £303,680; in 1884, £339,952; in 1885, £374,025; in 1886, £420,561; and in 1887, £464,337. The authorized capital of the Company is £1,000,000, of which £657,210 has been issued, and paid up in full. The debenture debt, including the issue referred to above, is £657,000. In regard to the dividends paid by the Company on its ordinary stock, these have risen from 8 per cent. per annum in 1878, to 17 per cent.—the latter being the rate declared at the last half-yearly meeting. In addition to these payments, a substantial reserve fund has been accumulated, the present amount of which is £113,750.

THE COMPOSITION OF THE AIR OF PUBLIC BUILDINGS.

In accordance with the instructions of the North-Eastern Sanitary Inspection Association, of Newcastle-on-Tyne, Messrs. P. Phillips Bedson, D. Sc., &c., Professor of Chemistry at the Durham College of Science, Thos. Watson Lovibond, F.I.C., and Walter D. Severn have made examinations of the constituents of the atmosphere in certain of the public buildings in Newcastle and Gateshead. The examinations were conducted in a very complete style; and the report deals with both chemical and bacteriological data obtained by the investigators. The methods of analysis adopted are fully explained in the report, which is consequently a memoir on air analysis for sanitary purposes. Time was when the comparative healthfulness and the contrary of air intended for respiration was supposed to be indicated with sufficient exactitude by its content of carbonic acid gas. The early sanitarians who devoted their attention to an analysis were astonished at the uniformity of the composition of out-door air in respect of the proportion of carbonic acid; and for a time the good old prescription of a "change of air" for invalids seemed to lack justification in fact. More comprehensive methods of air analysis, however, revealed the truth that common experience of the benefit of a change of air was well founded, and that the composition of atmospheric air does vary materially in different places; making some localities very much less desirable places of human residence than others. Although the proportion of carbonic acid present in a sample of air does not completely indicate the sanitary quality of such air, it furnishes, as Dr. Bedson and his colleagues are careful to state in the beginning of their report, a good criterion of the state of purity of the atmosphere of any given locality. For, not only can the variation in amount of this gas be determined with great accuracy, but the sources of the carbonic acid gas found in the air of assembly-rooms and dwellings, justly entitle it to be regarded as a gauge of the amount of general vitiation of the air. Among the sources of carbonic acid gas in air, the reporters name: First, respiration and exhalation; for whilst the air of a manufacturing town, when taken into the lungs, contains on an average four volumes of this gas in 10,000, respired air contains 438 volumes of carbonic acid in 10,000 volumes. Secondly, the various agents used for lighting purposes, by simple combustion, produce large volumes of carbonic acid; and the reporters reckon that an ordinary gas-flame, burning at the rate of 3 cubic feet per hour, produces 1·7 cubic feet of carbon dioxide in that time—the average production of a man being 0·7 cubic feet per hour. The reporters explain that the objection to the presence of an excess of carbonic acid in the air of living-rooms is not only that it is bad in itself, but also because it takes up space that ought to be occupied by oxygen, and even more because its invariable associates are worse than itself. The peculiar evil odour and stuffiness observed in entering from the fresh air a badly ventilated room do not arise from the carbonic acid gas, but are due to the substances produced with it and given off into the air from the lungs and skin of the occupants. The exact value of these bodies is still but imperfectly understood. They are undoubtedly organic compounds, as their origin indicates, and are compounds containing carbon, hydrogen, oxygen, and nitrogen. The reporters note that recent researches of MM. Brown-Sequard and d'Arsonval appear to show that among these compounds are minute quantities of substances of a distinctly poisonous character. It is the association of these substances with carbonic acid gas of animal origin which, until we can distinguish and arrest the substances themselves, makes of special value the determination of the amount of this gas in the air of inhabited spaces. For although, as Dr. Angus Smith showed by his experiments in a soda-water factory, it is possible for man to breathe, without discomfort, air containing much more pure carbonic acid gas than is ever found in the air of dwellings, still when the carbonic acid gas comes from animal respiration, it makes with air a very stupefying and poisonous mixture.

The method which was adopted by the reporters for estimating the proportion of carbonic acid in air was the well-known Pettenkofer process. For ascertaining the amount of organic impurity in the air a modification of the method adopted by Professor Carnelley, Mr. Haldane, and Dr. Anderson, at Dundee,* for investigating the composition of the air of schools, was chosen. The determination of the number of bacteria present in air is a delicate matter; and the history of bacteriological analysis is concisely given in the report. The method adopted by the reporters was Hesse's, sometimes with Dr. Percy Frankland's modification, consisting in the aspiration of a current of air through a tube coated on the inside with Koch's nutrient jelly. Colonies of bacteria establish themselves upon the surface of this jelly; and being counted give a number regarded as indicative of the purity of the air from which they came. The report goes at some length into the characters of the various kinds of bacteria—bacilli, micrococci, &c.—to be expected in air; but these we cannot repeat here, contenting ourselves with referring the curious in such matters to the original text. Air-borne fungi and yeasts are also duly dealt with. The investigations of the reporters, which embraced 26 public buildings, included determinations of the temperatures by wet and dry bulbs, the relative humidity of the air, the proportion of carbon dioxide in parts per 10,000 of air, the organic matter expressed as parts by volume of oxygen (in the form of permanganate of potash) required to oxidize the organic matter in 1,000,000 volumes of air, the number of bacteria in 10 litres of air, number of moulds in the same, total of bacteria and moulds, and ratio of bacteria to moulds, taking the latter as unity. This last return was expresed as bacteria over moulds: $\frac{\text{Bacteria}}{\text{moulds}}$, or $\frac{B}{M}$, which is an important result.

The first place visited by the reporters was the theatre, in which several tests of air were made before, during, and after the performance. It was found that the air contained little carbonic acid gas before the public were admitted. The ventilation of the Newcastle Theatre must be somewhat defective, notwithstanding, because in the afternoon, while there was nothing going on, the smell of the place is described as "unpleasant—resembling bad size." Bad as it was, however, the ventilation of the theatre was better than that of some public halls visited by the reporters. In a concert hall, with a very small audience, the carbonic acid went up to 37·1 parts. In another hall, crammed full, by 8.30 p.m., although the windows were open the proportion of carbonic acid went up to 30; the temperature being 67·5°, and the proportion of bacteria to moulds as much as 105·2. A singular result was brought out by two tests of a very large room before and during a dance. At 7.45 p.m., the fires were lit and the gas burning, the temperature being 54°, and the relative humidity 55. The proportion of carbonic acid was 13·9; of organic matter, 4·28; of bacteria, 7; and of moulds, 3—the ratio of the latter being 2·3. At 10.50, during the dancing of a valse, with the door open, the temperature rose to 80°, with relative humidity 88. Carbonic acid was 25·4; organic matter, 7·85; bacteria, 42; and moulds, 19—their ratio being 2·2. Thus a very much elevated temperature does not always imply a foul air; the scarcity of bacteria being remarkable. In a lecture theatre on one occasion, while the temperature did not rise above 61°, the carbonic acid went up to 22·7, and the proportion of bacteria to moulds reached the extraordinary ratio of 109·5. We cannot repeat the figures obtained with such pains from churches, schools, courts of justice, and workshops. These are detailed in the report, and summarized in the writers' conclusions. With reference to these data, it is remarked that more importance should be attached to a high proportion of carbonic acid than to numerous organisms. The amount of carbonic acid present, being the indicator and proportionate consequence of fouling either by respiration or combustion, is taken as a fair criterion within certain limits of the amount of contamination which has taken place. The number of organisms in the air is, however, largely affected by other influences than the fouling rate. The most important of these is the amount of mechanical agitation taking place by the movements of the audience, attendants, &c. There is a distinct though not very uniform relation between the ratio of bacteria to moulds, and the foulness of the air. It has been suggested by Carnelley that, for dwelling-houses and schools, the ratio should not be allowed to exceed 30 to 1; but the reporters scarcely venture to suggest a limit, while declaring that "it is quite certain that very foul air does commonly show a high ratio of bacteria to moulds." It is recorded that in air which has been artificially filled with dust by the movements of an audience, or by sweeping the floor, or shaking cloths and hangings, the contained bacteria show a majority of bacilla forms; while in air only contaminated by the quiet, natural exhalations of the occupants of a closely-packed room, the micrococcus forms predominate. There are not many micrococci found in the air of new and clean places of assembly, not over crowded, and occupied by well-dressed people accustomed to the use of soap and water. In churches the number of living organisms in the air is less than in most other public buildings—a result traced to the quiet demeanour of the congregations. The reporters bear witness to the good effect of continuously changing the air of rooms by mechanical means. Where mechanical ventilators were employed, the purity of air was found to be distinctly superior—more especially in the matter of living organisms.

In conclusion, the report very pertinently addresses a few remarks to the general reader on the subject of the living bodies found in air. It is observed that many people may feel greatly alarmed at hearing, perhaps for the first time, that they are breathing living organisms, sometimes by the dozen at every inspiration. These nervous persons are reminded, however, that the organisms are not new; but it is only their discovery and investigation that are of recent date. "We have breathed them for ages," as the report says, "and shall continue to do so without being able in most cases to trace any direct result to them." Common sense suggests, however, that as there is no doubt of aërial germs being occasionally the means of communicating disease, any system of ventilation which reduces the number of these germs in the air breathed by a crowded assembly, by carrying off the polluted air as fast as it is exhaled, must in corresponding measure reduce the risk of inhaling poisonous germs which is run by the constituent members of that assembly. The risk of acquiring specific diseases by means of aërial germs inhaled in crowded rooms is at most a small one, in the estimation of the reporters. Far more serious, because more common evils arising from breathing contaminated air for long periods are, first, the enervating, depressing effect generally experienced at crowded meetings, due to the air being mixed with an excess of carbonic acid. When the object of the meeting is not very exciting, the effect of the heavy air is shown in sleepiness; but when the assembly is kept awake, it is apt to pay for it afterwards in headaches and sore throats. Secondly, large numbers of organisms and dust particles in the air

* See JOURNAL, Vol. XLIX., p. 1119.

have an irritating effect, even when not absolutely poisonous. In good health, air loaded in this way may apparently be breathed with impunity, as they are arrested in the air passages of the body by natural means; but when a slight cold or catarrhal tendency exists, the case is otherwise. On the whole, so far as the condition of the public buildings of Newcastle is concerned, the reporters declare that, with scarcely an exception, they would be all the better for improved ventilation. Churches, assembly rooms, and places occupied for a comparatively short time may be ventilated, the reporters think, by a good system of exhausting shafts well heated; but they much prefer mechanical ventilation for all places of a sufficient size. They wisely remark that "one essential in all systems of ventilation is the proper warming of the fresh air. If this is not done, the first cold day in winter is the signal for closing all ventilating apparatus for the season, if not for good. Most of us would rather be stifled than frozen." The last sentence should be taken as an axiom by all devisers of ventilation schemes.

It will be seen from this abstract that the report in question is a very exhaustive and instructive compilation. It was, of course, no part of the writers' duty to suggest systems of ventilation in detail. They were content to show the need for it in general; and they have discharged this portion of their task with such thoroughness that it may well be imagined how some nervous Newcastle people will feel disposed to shun certain of the buildings mentioned in the report until their present defects of aërial sanitation have been rectified.

THE USE OF HIGH-POWER GAS-BURNERS IN BELGIUM.

In the course of a letter addressed to us on the above subject, a correspondent calls attention to a movement, which, if unchecked, is, he considers, likely to prove detrimental to the increased use of high-power gas-burners—viz., the introduction of this class of appliances of inferior construction by makers whose names are comparatively unknown in the scientific world. Of course, it may be urged that the market for these articles is open, and everybody has a right to compete for patronage of his wares. The point enforced by our correspondent, however, is that burners are put forward as being capable of very high duty, without having any well-known name to support them, or to justify the purchasers in expecting the promised extraordinary results. The adoption of such appliances by the uninstructed and too-credulous public would, in all probability, lead to disappointment; and thus bring into discredit a class of articles which, when properly made, perform their duties efficiently, but which certainly fail to do so when the scientific principles which should govern their construction have been ignored, if they were ever known. Our correspondent, after briefly referring to the circumstances which led to the current of invention being turned in the direction of improved gas lighting, says: "Ten years ago, Siemens, Bower, Wenham, Somzée, and others, were engaged in the endeavour to solve a problem in connection with gas lighting of which they were the first to recognize the importance. The invariable progress of inventions requires that every improvement must at the outset encounter public indifference, which is encouraged by the inertia and systematic opposition of those manufacturers who are interested in the maintenance of the existing situation. But no sooner does the necessity for an improvement become absolutely manifest, than the very people who headed the opposition to it are the first to rush into and obstruct the road which the pioneers have opened and prepared for them. This over-zealousness of men who are merely imitators, is productive of considerable inconvenience. With the view of making up for lost time, the movement to which I am referring is carried on with such precipitation, that the real object to be attained—viz., progress marked by improvement—is entirely neglected. Moreover, improvements become impossible, or at any rate their development is checked, by commercial competition, the result of which is the throwing upon the market of a multitude of imitations as numerous as they are common, which spring up like mushrooms, are too often of no practical value, and are offered to the public at an absurdly low price. This is the situation in which the first inventors of high-power gas-burners have been placed in Belgium by competitors who are not only unknown in the world of scientific research, but are in most cases ignorant of the technical data upon which the appliances they copy are constructed. The consequence of all this is that there are now being sold in Brussels high-power gas-burners of all shapes and denominations—manifest reproductions of various systems—some good, others bad. The sole object being to do a good stroke of business during a favourable condition of the market, the aim of these people has been to turn out, as quickly as possible, a number of bad copies of excellent appliances at a very low price, and without the slightest guarantee as to their working capacity. The effect of this flooding of the market with articles of inferior quality, differing from each other only in a few unimportant details, is simply to confuse the public mind. Certain makers of these lamps in Brussels go so far as to conceal their identity under initials; while others puff with a high-sounding name, and an American trade mark, an article of purely local manufacture. All, however, are agreed upon one point—viz., the assertion of absolutely impossible light-giving power for their burners; while in most of their articles there are wanting the ordinary elements forming the criterion of a well-acting and economical lamp."

Notes.

Rust-Bronzing for Chemical Machinery.

In chemical works and certain parts of gas-works, it is practically impossible to keep bright parts of engines and machinery from rusting. In the chemical establishments of Messrs. Kuhlmann, as stated by M. Hochstetter to the Industrial Society of the North of France, the attempt to maintain bright iron and steel work has long been abandoned, and the engines are only rubbed with a greased rag. This with the rusting of the metal forms in time a kind of bronzing which has a rather agreeable effect to the eye, and only requires the passage of a greasy rag to maintain it in perfection. When it is desired to obtain the bronze effect more rapidly, as in the case of a new machine, it is the practice to stand in its vicinity a vessel containing fuming hydrochloric acid and others containing ammonia. The vapours given off from these receptacles quickly act upon the bright iron exposed to them; and after a few days of this treatment, accompanied with regular rubbings with the greasy rag, the machines are effectually "bronzed." The idea is not very attractive to engineers and works managers who like to see metal work kept as bright as when it left the shop; but where a disproportionate amount of labour and expense is required for this object, which may be after all only partially attained, it is probably wiser to accept the conditions and to make the best of them, according to the principle, if not always by the methods described by M. Hochstetter.

The Loomis Water Gas Process.

A Loomis water gas plant has just been erected, according to the *Iron Age*, at a saw and file works at Tacony, a suburb of Philadelphia. The chief point of difference between the Loomis and other systems of making water gas lies in the fact that with the former the draught in the generator is downwards during the period of "blowing-up," when the fuel is being brought to the degree of incandescence required for the decomposition of steam, which is then passed through it in the upward direction. The operation of gas making therefore consists of two distinct working periods, during each of which a product is obtained. While "blowing-up" with air by the down draught, the product is generator gas produced by the combination of the air with the carbon of the fuel. This draught is caused by an exhauster pulling from the bottom of the generator, so that the intensity of the combination, and the volume of gas generated, are perfectly under control. The other product is water gas, produced by allowing steam to enter from below into the column of incandescent fuel. The advantage claimed for the down-draught system is that, when the coal is being made hot during the blasting period preliminary to the manufacture of water gas proper, the volatile vapours are fixed by passing through the hot coal, and the troublesome tar, &c., is decomposed. This device it is also claimed reduces clinkering and makes a more uniform product. The plant consists of four generators, each 9 feet diameter outside; the walls being 18 inches thick, and 14 feet high. The grate and charging hopper are both air tight. The gas is cooled by water (afterwards used for boiler feed) before going to the Roots exhauster. The relative production of the two kinds of gas shows a yield of from 130,000 to 140,000 cubic feet of generator gas to from 40,000 to 50,000 cubic feet of water gas, according to the quality of the fuel used. Each 6-feet generator will gasify 8 tons of coal per day of 24 hours. When making gas for fuel, as much steam is used as is consistent with continuous working.

Slide-Rule for Reducing Volumes of Gases to Normal Condition.

At a recent meeting of the Liverpool Section of the Society of Chemical Industry, Mr. Hurter exhibited a small appliance that might be adopted as a useful adjunct in connection with photometrical observations and all experiments in which gases have to be reduced to standard conditions of temperature and pressure. It consisted of a slide-rule only 6 or 7 inches long, ranging in extent from 700 to 780 mm. for the barometer and 270° to 300° absolute temperature (Centigrade). By simply setting the given temperature on the slide opposite the given barometric pressure, the index at once points to the factor of reduction. The instrument could, of course, be arranged to suit the English standard of inches of mercury and degrees Fahrenheit, and, if made at a moderate price, would doubtless find a very ready sale in gas engineering circles.

The Determination of Carbonate and Caustic in Commercial Limes.

A process for this purpose is described by Mr. Percy Bateson in the *Chemical Trade Journal*, The solutions required are sulphate of soda, 100 grammes per litre standard hydrochloric acid (36·5 grammes pure HCl per litre), and carbolic acid. The latter is prepared by adding water to crystallized carbolic acid, allowing to stand, and drawing off the oily-looking liquid from the excess of water by means of a separating funnel. This oily liquid contains about 66 per cent. of C_6H_6O. Weigh out quickly and accurately 2·8 grammes of the very finely-powdered sample, transfer to a flask with a mark at 500 cc.; and slake with a small quantity of hot water. Add the equivalent, in the above solutions, of 10 grammes of pure sulphate of soda, and 15 grammes of pure phenol (carbolic acid); make up to about 300 cc.; warm to 100° Fahr.; well shake; and, after thoroughly cooling, fill up again to the 500 cc. mark with

water. Filter and titrate 250 cc. with standard hydrochloric acid. The cubic centimetres of acid so obtained, multiplied by 2, give the percentage of CaO. Ascertain the total lime present in the sample by titrating with standard acid in the usual way. The difference between the two results gives the amount of CaO present in the form of carbonate. In an experiment tried by the author, the result was 90·83 per cent. of CaO, and 8·28 per cent. of $CaCO_3$.

THE EMPLOYMENT OF COAL TAR PRODUCTS FOR THE PREPARATION OF ALKALIS.

At a recent meeting of the Liverpool Section of the Society of Chemical Industry, a paper was read by Mr. W. Stavely, giving a description of a novel process which he had invented for the preparation of alkalis, notably of carbonate of soda, and in which crude cresol or phenol derived from coal tar plays an important part. It appears that many attempts have been made to prepare carbonate of soda from a solution of the sulphate by the action of slaked lime; but only a portion of the salt has been decomposed. Mr. Stavely has found that, when under suitable conditions a mixture of cresol or phenol and slaked lime, with solution of sulphate of soda are agitated together in the requisite proportions, the decomposition of the sulphate of soda is almost perfect; sulphate of lime precipitating, and cresolate of phenolate of sodium being in solution. This solution when treated with a current of carbonic acid, which may be derived from any cheap source—such as furnace gases, &c.—gives carbonate of soda and free phenol or cresol, which rises to the surface and may be used again. The solution of carbonate of soda so obtained is evaporated to obtain the solid carbonate as "soda ash." The loss of phenols in this process is not great; but the cost of this method of preparing carbonate of soda has not yet been fully tested on a practical scale as compared with the well-known "Leblanc" and soda-ammonia processes. Theoretically, the method is exceedingly interesting, in being the first practical suggestion for the employment of a cheap organic product as an agent for the preparation of an important inorganic compound; and it is further interesting to those concerned in the gas industry as affording yet another possible outlet for coal tar products.

STEEL FOR WATER AND OTHER PIPES.—In reference to the "Note" on the above subject (from *Engineering*) published in our issue of the 1st inst., Mr. James Riley writes that it was an error to state that the contract for the supply of the pipes for conveying water across the Tay Bridge was carried out by his Company; the actual contractors being Messrs. Duncan Brothers, who have paid considerable attention to this class of business for some years past, and are now constructing the main for Mexico referred to in the same paragraph.

THE DEVELOPMENT OF WATER-WORKS IN JAPAN.—A fortnight ago we referred to the progress of the water supply undertaking at Yokohama, and mentioned that they were the first works of the kind in Japan. We now learn from the *Japan Herald*, of the 6th ult., that the petition for permission to incorporate the Tokio Water-Works Company has been lodged with the authorities. The capital will be 5,000,000 yen; and the charter has been obtained for 35 years. It is thought that four years will be necessary for laying the pipes in Tokio city alone, and dividend to shareholders will not be declared until the third year after the completion of the work; the capital being also paid back at the same time. The estimated profit is from 6 to 10 per cent.; and it is expected that the entire capital will be paid off in 30 years, at the rate of 60,000 yen per annum, after which time the works will become the property of the city. The promoters of the scheme have already spent over a year-and-a-half in bringing the matter to an issue; Major-General Palmer being paid 2900 yen for his services. As so much money and time have already been spent in embodying this scheme, the projectors have added a word to the petition to the effect that if the Committee for the reorganization of Tokio city will undertake the work, they will present them with the scheme for their consideration.

COAL OIL AND NATURAL GAS.—People often talk of the advantages of natural gas as a fuel without having an adequate idea of its importance, says the Editor of *Stoves and Hardware*, published at St. Louis. It is the greatest commercial wonder of the age; and no one can ponder over the following figures without being deeply impressed:—It is only 15 years ago that natural gas was first used as a fuel; yet to-day there is required to pipe it 27,350 miles of mains. In Pittsburg alone, 500 miles supply 42,698 private houses, 40 iron-mills, 37 glass-works, 83 foundries and machine shops, and 422 miscellaneous industrial establishments. An idea of its value as fuel can best be obtained when the value of 7 million tons of coal is estimated; as it is asserted that this amount of coal is annually displaced by natural gas. Some idea, too, of the effect a retarded production has in advancing prices can be seen in the shut-down movement in oil production. This commenced in earnest just about a year ago; and the following is the result: In 1886, when no attempt was made to lessen production, the average run from wells was 70,666 barrels per day. In 1887, when there was less than two months' organized effort in this direction, the average daily run was 68,545 barrels. In ten months of 1887, ending Nov. 1, when the movement was on foot in earnest, it was less than 44,000 barrels per day. The average price of certificates for the first ten months of 1887 was 64¾ cents. For the first ten months of 1888 it was 87 cents—an increase in value of 34½ per cent.

Communicated Article.

THE CHEMISTRY OF ILLUMINATING GAS.

By NORTON H. HUMPHRYS, Assoc. M. Inst. C.E., F.C.S.

III.

A great number of experiments have been tried from time to time with a view of illustrating the comparative value, light for light; obtainable from given quantities of gas, oil, and candles. The results of these experiments are interesting, as indicating the practical value to the public of the various forms of artificial light; but still the information afforded is not complete, for it does not take into consideration the numerous advantages—such as safety, saving of trouble, &c.—possessed by gas as compared with lamps and candles, and which have been sufficiently strong to bring gas into favour in many localities, where its cost is such as to preclude all considerations of an economical nature. When we read in our English newspapers the complaints of consumers, with threats to adopt other forms of illumination, and the grievance turns out to be that 4s. or so per 1000 cubic feet is the price charged for gas, we cannot but wonder how it is possible to do business with gas at five or six times this price, as is the case in some parts of the world. Having mentioned this point, we proceed to direct attention to some of these investigations.

Messrs. Booth & Garrett, of the Franklin Institute, U.S.A., tried some experiments with gas, petroleum, and candles, with a view of arriving at the relative light-giving powers of each.* The gas which they employed was that ordinarily supplied to the city of Philadelphia; and it was consumed in the usual manner through a fishtail burner, without any precautions as to pressure, &c., the rate of consumption being 5·3 cubic feet per hour. So far as can be judged from some of the experiments, this rate of flow was not sufficient to do justice to the gas. Ordinary oil-lamps were used, having a flat wick 0·7 inch broad. The conclusion arrived at by the authors was that 2·8 gallons of petroleum were equivalent in lighting effect to 1000 cubic feet of gas; but at the same time they remark that variations to the extent of 15 per cent. were observable, due to variations in the pressure of the supply.

The most interesting feature of their experiments is the observations on the effect of the wick as regards illuminating value. They give the results of clipping the wick in several different ways, commencing with a clean straight cut, and proceeding to a convex, a concave, angular, and irregular cuts of wick. It is evident from these results that unless very great care is exercised in securing a perfectly clean horizontal cut of wick, the results afforded by the lamp will range from 10 to 20 per cent. below the maximum duty. The effect of a clean cut, but slightly out of the horizontal, was to increase the relative consumption of oil from 100 to 114, in order to maintain an equal degree of light. A few threads projecting above or below the line of wick influenced the results to a similar degree. An oil-lamp that is giving its best results should yield a perfectly straight edge at the top of the flame. If there are points, horns, or irregularities, a considerable waste of light-giving effect is taking place. The effect of the wick in respect to candles is interesting at the present time, when the efficiency of the sperm candle as a standard of light is being called in question. The authors used paraffin, sperm, and "adamantine" candles, and in each case the best results were obtained when the tip of the wick was curved nearly at right angles so as to prevent an accumulation or bead of snuff on the end. The paraffin candles, with wicks in normal position, being taken as 100, the effect of a bead of snuff on the end of one of the wicks (they were used in pairs) increased the relative consumption to 106. Sperm candles, with the wicks in order, as above suggested, showed a consumption equivalent to 108; but when the wicks were elongated, and had beads on the ends, the relative consumption increased to 131. Under the best conditions, the sperm candles, and also the paraffin candles, gave a light equal to $\frac{1}{10}$th that of the gas—which shows that the fishtail burner was utterly unsuitable, or else that the gas was deficient in quality—and it was calculated that 34½ lbs. of paraffin, or 37½ lbs. of sperm candles, were equivalent to 1000 cubic feet of gas. A comparision in respect to cost is also worked out, Taking gas at 9s. 6d. per 1000 cubic feet and petroleum at 1s. 10d. per gallon, the latter is about half the cost of the former. The cost of the candles is greatly in excess.

About two years subsequent to the above experiments, Mr. William Marcet gave some information on the subject in the course of a paper read before the Society of Arts.† He found that a petroleum lamp gave its best effect when the receiver was not less than half full of oil, and when the flame was fan-shaped, with a horizontal top edge. This result he secured by carefully trimming the wick exactly horizontal and then bevelling the edges laterally, so as to give the wick a slight convex shape in transverse section. He preferred a wick ¾-inch in breadth, turned up just below the point of smoking, and then found that he secured a light equivalent to 6½ sperm candles with a consumption of 420 grains of petroleum per hour. To secure an equivalent amount of light from coal gas, he used nearly 4 cubic feet per hour, showing that, like the previous investigators, he was ignorant as to the proper method of burning coal gas in such a manner as to develop its best effects, and simply took an ordinary burner, using it without any precautions as to pressure. He calculated that the petroleum was about twice as costly as gas at 4s. 6d. per 1000 cubic feet. Taking one pennyworth of petroleum as a standard,

* See JOURNAL, Vol. XI., p. 471. † *Ibid*, Vol. XIII., p. 239.

the cost of gas to give an equivalent amount of light would be about ½d., sperm oil, 2½d., colza oil, 1½d., sperm candles, 9d., composite candles, 6½d., and tallow candles, 5d. If we assume the specific gravity of the petroleum used to be 0·8, one gallon of it would last 133 hours. Taking it at 0·9, one gallon would last 150 hours. According to this author, then, one gallon of petroleum is equivalent to from 500 to 600 cubic feet of gas. If we reject his excessive estimate of 4 cubic feet of gas per hour to produce a 6½-candle light, and substitute 2 cubic feet, which is more like a correct quantity, the result will be one gallon of petroleum = 300 cubic feet of gas or less, or 1000 cubic feet of gas = about 3½ gallons of petroleum.

At the 1866 meeting of the British Association of Gas Managers, a paper was read by Mr. Hall, Gas Superintendent of the London and North-Western Railway Company, on the "Lighting of Railway Carriages"* in the course of which it appeared that the author had made careful experiments as to the comparative cost of lighting by means of olive oil, petroleum burned in a special lamp devised by himself, and coal gas. Taking as a standard a train of six carriages, comprising 27 lights, in constant use for 48 hours, he said that the requirements would be within 3888 cubic feet of gas, 5½ gallons of olive oil, or 5¼ gallons of petroleum, according to the agent used. The cost of these materials respectively would be 11s. 8d., 24s. 9d., and 11s. 10d.; gas being taken at 3s. per 1000 cubic feet, olive oil at 4s. 6d. per gallon, and petroleum at 2s. 3d. But the light-yielding effect would be 15, 6, and 3·6 respectively; so that taking this into consideration, the relative cost would be—

Gas	2s. 9½d.
Petroleum	7s. 1d.
Olive oil	24s. 9d.

From these figures it appears that 1000 cubic feet of gas are equivalent in lighting effect to 3 gallons of petroleum, or to 6 gallons of olive oil.

Dr. Stevenson Macadam recounted the results of a very elaborate series of experiments—including common dip or tallow, composite, and paraffin candles; sperm, rape, and whale oils; paraffin, and petroleum oils; and coal gas—at the 1872 meeting of the North British Association of Gas Managers.† A large number of experiments were tried, embracing different sizes of candles, various kinds of lamps, and a series of gas-burners ranging in hourly consumption from 5 to ½ cubic feet. The paper can therefore be recommended to the careful attention of all interested in this subject. The standard of light used was the sperm candle, consuming 120 grains per hour. They were of the best quality and usually came within the limits of 120 to 122 grains per hour. Anything outside the range of 117 to 125 grains per hour was considered not conclusive, and the photometer-room was kept at a uniform temperature of 60° Fahr. throughout the experiments. The cost of the various materials is given as follows:—Common tallow candles 6d., composites 8d., and paraffin candles 1s. per lb.; sperm oil 9s., colza 5s., whale 4s.; and paraffin 2s. per gallon; 28-candle coal gas 5s. per 1000 cubic feet. The tallow candles burnt at the rate of 200 grains, the composites, 154, and the paraffin, 137 grains per hour. The flat-wick lamps consumed about 0·4 oz. of oil per hour; and the Argand lamps about 2 oz. per hour. This refers only to the natural oils. The paraffin oil was tried in a series of five lamps,—respectively called the Cottage, Parlour, Dining-room, Small Argand, and Doty's Argand, the consumption ranging from ¾ oz. up to 2 oz. per hour. The results are calculated out into the light equivalent in candle hours furnished by one-pennyworth of each equivalent, and the following table is a summary. The greater the number furnished, the cheaper is the light, so that the figures, taken in a converse sense, furnish a relative idea of the value of each illuminant.

Candles about	7
Oils in common flat-wick lamps	5 to 8
" Argand "	7 to 14
Paraffin oils at 2s. per gallon	54
" " 1s. 6d. "	72
Gas-jet No. 5	93
" " 4	87
" " 3	77
" " 2	65
" " 1	50
" " ½	33

It is remarkable that the results with paraffin oil were in all cases nearly alike, notwithstanding the different rates of consumption and various kinds of lamps used. The difference in this respect exhibited by the gas is very marked, though it will be observed that it is chiefly represented by the very small burners. At rates of consumption ranging from 3 cubic feet per hour upwards, the gas at 5s. is cheaper than paraffin at 1s. 6d. Taking the best results, that afforded by the No. 5 jet, 1000 cubic feet of gas are equivalent to more than 4 gallons of paraffin. It should be mentioned that the pressure was carefully regulated so that each size of the burner consumed its nominal quantity, and to this precaution may be attributed the fact that Dr. Macadam obtained better results from coal gas than the previous investigators. After allowing for the rich gas he operated with, he obtained 28 candles with a consumption of 5 cubic feet, whereas Mr. Marcet did not obtain one-fourth of the quantity with a consumption of 4 cubic feet, and Messrs. Booth and Garrett only obtained about 10 candles duty with a consumption of 5·3 cubic feet of gas per hour.

* See JOURNAL, Vol. XV., p. 536. † *Ibid*, Vol. XXI. p. 763.

Technical Record.

THE GAS UNDERTAKINGS RETURNS.

The returns relating to the gas undertakings of the United Kingdom, ordered by the House of Commons to be printed as far back as Aug. 9 last year, were only issued on the 10th inst. No explanation is given of the prolonged delay, which has largely robbed the figures of any interest except as dry records; inasmuch as the returns so far as the Gas Companies are concerned are more than a twelvemonth old, and for the Local Authorities nine months and more—the years being made up to Dec. 31, 1887, and March 25, 1888, respectively.

Particulars are given as to 384 authorized gas undertakings belonging to Companies, all but 13 of which are in England and Wales. Of the Local Authorities owning gas-works, 168 made returns; and of these 135 relate to England and Wales, 28 to Scotland, and 5 to Ireland. The total amount of capital authorized for these 552 gas undertakings (including in a few instances amounts raised by Local Authorities for purposes other than gas, but which cannot be distinguished at the present time) is £74,289,595; and the amount paid up and borrowed is £57,478,015. The total receipts and expenditure are (respectively) £14,928,616 and £10,304,687. From the 8,962,831 tons of coal and cannel carbonized 91,371½ million cubic feet of gas were made, of which 83,658½ millions were sold so far as the returns show (for in 27 instances the column in question remains blank). 20,113 miles of mains are employed in the distribution of gas to 2,163,258 consumers and 423,580 public lamps.

Comparing these figures with similar entries for previous years, it will be seen that the capital obligations of the Companies are as follows:—

Year.	Share and Premium Capital Paid up.	Loan Capital Issued.	Capital sold under Auction Clauses.	Premiums realized.
1882 . .	£28,589,148	£4,345,787	£2,065,905	£957,561
1883 . .	29,038,726	5,075,804	2,538,709	1,088,675
1884 . .	29,594,464	5,330,550	2,810,415	1,188,750
1885 . .	30,109,429	5,404,141	3,088,460	1,306,238
1886 . .	30,960,026	5,679,830	3,209,564	1,393,773
1887 . .	31,556,788	5,839,792	3,354,093	1,473,656

Some of the other comparative details in the Companies' returns are these—

Year.	Tons of Coal Carbonized.	Cubic Feet of Gas Made.	Number of Consumers.	Public Lamps Lighted.
1882 . .	4,928,695	49,360,289,059	1,055,009	224,300
1883 . .	5,171,963	52,330,749,963	1,091,388	235,338
1884 . .	5,361,576	54,452,255,864	1,102,628	242,782
1885 . .	5,595,371	56,903,060,785	1,115,223	250,404
1886 . .	5,777,966	59,051,111,814	1,133,897	258,072
1887 . .	5,977,254	61,266,055,857	1,152,119	264,316

The somewhat similar figures of the Local Authorities are—

Year.	Amount Borrowed, Including Annuities (not deducting Amount repaid).	Receipts.	Expenditure (exclusive of Amount in next Column).	Interest, &c., Paid.*	Net Profit after Payment of Items in preceding Column.
1882. .	£17,326,183	£4,098,828	£2,759,304	£845,936	£510,268
1883. .	17,874,351	4,252,296	2,877,732	873,921	524,010
1884-5 .	18,758,895	4,334,059	3,066,386	894,836	399,714
1885-6 .	19,619,416	4,348,105	3,117,989	901,773	355,469
1886-7 .	19,723,046	4,403,262	3,127,047	951,636	359,532
1887-8 .	20,081,435	4,495,093	3,161,604	923,157	439,467

* These figures include: (1) Interest paid on loans; (2) amounts paid for annuities (3) amount of loans repaid; (4) amount paid for redemption of annuities; (5) amount placed to sinking fund.

Year.	Tons of Coal Carbonized.	Cubic Feet of Gas Made.	Number of Consumers.	Public Lamps Lighted.
1882 . .	2,352,062	23,223,054,342	916,962	137,011
1883 . .	2,459,341	24,507,217,850	928,458	140,198
1884-5 . .	2,642,942	26,120,491,840	955,728	144,506
1885-6 . .	2,783,533	27,734,666,850	979,802	151,670
1886-7 . .	2,879,765	28,880,425,240	996,480	155,849
1887-8 . .	2,985,577	30,105,457,962	1,011,139	159,264

THE WORTHINGTON PUMPING ENGINES AT THE NEW RIVER COMPANY'S WORKS.

The makers of the Worthington pumping engines, Messrs. James Simpson and Co., Limited, of Pimlico, have sent us for publication some particulars of the construction and working of the engine they have erected for the New River Company at their Stoke Newington pumping station.

The engine is of the high-duty type, and has low-pressure cylinders 54 inches in diameter; the high-pressure cylinders being 27 inches, and the pumps (which are double acting) 28 inches in

diameter—all having a stroke of 3 ft. 6 in. The steam is cut off in the high-pressure cylinder so as to make a total of about twelve expansions before it passes into the condenser; and this is accomplished without the intervention of any crank and fly-wheel or heavy pump-rods or balance-bobs to absorb the excess of power at the beginning of the stroke, and give it out at the end when the pressure in the steam cylinders falls below that required to balance the water pressure. This is done by small oscillating cylinders, the piston-rods of which are connected to a cross-head on the main piston-rod.

Two of these engines have been tested by Professor Unwin, F.R.S., and Mr. E. A. Cowper, M. Inst. C.E.; and they have given most interesting and elaborate reports upon them—going very fully into all details; but some figures taken from the daily and weekly coal returns of ordinary work of the Company will be more useful than particulars of a trial even of 24 hours' duration.

New River Water-Works.—Return relating to the Worthington Engine.

Three boilers at work; small coal used all the time; ash and clinker, 7 cwt. in each twelve hours.

Date. 1888.	Hours at Work.	Gallons Pumped.	Head in Feet.	Coal used. Tons.	Cwt.
Nov. 28 . . .	1	368,200	156·00	4	4
	12	4,455,220	156·00		
„ 29 . . .	9	3,129,700	156·00	7	4
	12	4,528,860	156·00		
„ 30 . . .	11½	4,234,300	156·00	7	8
	12	4,418,400	156·00		
Dec. 1 . . .	11½	4,271,120	156·00	7	8
	12	4,492,040	156·00		
„ 2 . . .	12	4,418,400	147·75	3	12
„ 3 . . .	12	4,418,400	148·75	3	16
	12	4,455,220	147·75	3	12
„ 4 . . .	12	4,455,220	148·60	3	16
	12	4,455,220	147·00	3	12
„ 5 . . .	12	4,455,220	146·75	3	16
	12	4,492,040	146·25	3	16
„ 6 . . .	12	4,492,040	144·60	3	16
	12	4,492,040	144·75	3	12
„ 7 . . .	12	4,418,400	153·50	3	16
	12	4,455,220	148·25	3	12
„ 8 . . .	12	4,455,220	147·33	3	16
	12	4,418,400	153·00	3	16

Percentage of ash and clinker in coal = 9. This gives a duty of 2·5 lbs. of coal, including ash and clinker, per pump horse power per hour, or 88·75 millions.

Subsequent tests—from Dec. 9 to 15 (inclusive)—gave an average head for the 164½ hours of working of 146 ft. 10 in. The quantity of coal used was 52 tons, inclusive of ash and clinker. This consumption of fuel pumped 86½ million gallons of water; or 2·56 lbs. per pump horse power per hour. From Dec. 16 to 22 (168 hours) 52 tons 8 cwt. of coal, &c., were used for pumping 89¾ million gallons of water against an average head of 149·4 feet. This gives 2·47 lbs. per pump horse power per hour.

The great advantage claimed for these engines is the absence of any heavy moving parts, and of the crank shaft and beam—all which reduce the friction of the engine and the cost of maintenance.

THE CONSTRUCTION OF A TRIPLE-LIFT GASHOLDER IN AMERICA.

The question of gasholder construction still occupying a prominent position in gas engineering circles, it may be of interest to our readers to reproduce from an American contemporary—*Light, Heat, and Power*—a description of a tank and holder erected at Laclede, from plans and specifications prepared by the Company's Engineer, Mr. Frederick Egner. The writer of the description as it appeared in our contemporary, assisted in the execution of the work; and so is enabled to give much valuable data.

Work upon the tank excavation was begun in April of last year. The sub-soil was of the best—a hard clay—which permitted of removal by scrapers. A bed rock of limestone formed a foundation upon which reliance might be placed as to strength and stability; and this at a depth of less than 2 feet below the footings. In excavating the clay, no piling was necessary, and its "angle of repose" was not considered; yet the sides of the hollow were in many place perpendicular, and at no point exceeded a deviation of 30°. Near the rock, the earth assumed a grayish colour; and its extreme hardness required the use of picks to remove it. Three springs of water, encountered at a depth of about 17 feet, caused some inconvenience at the first; but were afterwards turned to account in puddling.

In diameter the tank measures 124 ft. 1 in.; and its depth, from top of curb to bottom of landing-stones, is 29 feet. A mound of earth of 18 feet in height was allowed to remain in the centre; and this was surmounted by the brick centre pier, capped with iron at the level of the curb. With regard to the material and workmanship of the tank construction, the specifications were explicit—"The whole to be of the best hard bricks, to be laid closely . . . . and well bonded. The joints to be broken in a careful and regular manner, every joint being carefully rubbed up and flushed with mortar the whole breadth of the wall . . . . All the joints to be neatly pointed up with Portland cement as the work proceeds." It is but justice to the contractor to state that the specified directions were closely observed. The first 8 feet in height of the wall were laid in English bond (alternate courses of headers and stretchers); but above that three courses of stretchers to one header was the rule. This gave a somewhat less solid construction than that below; yet one amply strong for the decreased pressure of contained water at the lessened depth. A 6-inch coping of stone completed the wall. The thicknesses of the outer wall for successive heights of 7 feet from the bottom are respectively 36, 32, 28 and 24 inches. Twelve piers for columns were bonded with the wall around the tank; and including the walls opposite each, the thicknesses at the piers are 6 ft. 2 in. to 5 ft. 2 in. by successive steps; and the widths 7 ft. 9 in. to 5 ft. 6 in. by lessened breadths corresponding in position to the decreasing thicknesses.

After the preliminary survey for the wall, a tram-bar was used to preserve the circle as the work progressed. This apparatus, constructed of wood and iron, only differed from the usual form in having lateral trussing to prevent buckling in its somewhat unwieldy 62 feet of length. The mortar throughout the tank was composed of one part Portland cement to two parts clean, dry sand. The concrete, which covered the entire bottom of the tank and the mound to a depth of 12 inches, and extended 2 feet beyond the outside of the wall and piers, was carefully compounded in the proportion of 693 inches of sand and 462 inches of best Portland cement to 1 foot of Macadam stones; these figures having special reference to the particular Macadam employed. It was further specified that the cement was to weigh not less than 400 lbs. per barrel of 2½ bushels. Well-prepared clay puddle, 2 feet and more in thickness, and rammed in 6-inch layers, formed the backing for the wall and piers. At the entrance for the inlet and outlet pipes, the wall was carried 3 ft. 4 in. below the floor of the tank, and arches turned over the openings. The 20-inch pipes were laid in the solid rock, blasted to receive them; and the tank bottom was made tight with cement. The tank was not filled with water and tested until after the ironwork was finished. In the interval, the mortar, concrete, and puddling had time to "set;" and when, four months after the tank's completion, the water was introduced, no sign of a leak was detected.

On Aug. 7, the tank was announced finished; and the erection of the ironwork was begun. The cup of the inner section was first built; its channel-iron resting on the landing-stones at the tank bottom. To this the lower side sheets were attached to a height of about 5 feet, above which the work was done from scaffolding within the enclosed area, and between the sheeting and the wall on staging supported by outriggers. Within the tank, so as to support the crown, a permanent scaffold with oak uprights had been previously erected, the shoes of which were embedded in the concrete. Upon this, temporarily re-enforced for the riveters, the crown was constructed. No crown trussing was introduced; but the inner section was braced by forty-eight 9-inch **I**-beams, and twenty-four of these vertical legs were trussed by cast-iron jawed struts, over which were passed 1-inch tie-rods joined by sleeve-nuts in the centre. On the outer side of the section, vertical strips of ½-inch by 6-inch iron were secured through the sheets to the trussed legs; and upon these strips, the barrel rollers of the middle lift have their bearings. The cup of the middle section was formed upon heavy timbers projecting over the wall, secured by weights at their outer ends, and levelled with one another around the entire circumference of the holder. After the cup and one row of sheets were in position, this structure was lowered by long-threaded screws, one at each timber, and work was continued at the ground level. When the 4 feet in length of the screws was down, links were attached one by one to the hooks at their lower ends; and this operation was repeated until, with the completion of the inverted cup, the second section rested at the bottom of the tank. The outer section was similarly built; and during its construction, work also progressed on the guide-framing.

The three lifts of the holder are respectively 122, 120, and 118 feet in diameter; and each, including the cup, is 28 feet in height. The hydraulic and inverted cups are each 15 inches deep by 8 inches wide, formed of channel-iron as previously indicated; and their edges strengthened by 2 feet by 1 inch bead-iron. In each cup are 48 bearing pieces, 8 inches long by ½ inch thick, the butt-plates being but ⅜ inch in thickness. The centre plate of the crown is ⅜-inch thick, and 6 feet in diameter. The upper curb is formed of two rows of angle-iron and two rows of plates ¼ inch thick held in position by ¾-inch stay-bolts, encased in "thimbles" of extra strong tubing. The upper row of ¼-inch plates, 12 inches wide, was rivetted to a row of crown plates of No. 6 iron, between which and the centre-plate the sheets used weighed 5·4 lbs. per square foot.

No points of particular novelty exist in the side sheeting of the three sections, except that their joints, as well as those of the crown, were made iron to iron, with no intervening material whatever. A slight oxidation rendered tight the seams; and all other portions of the iron received two coats of red lead. The columns are 91 feet in height over all; their shafts 4 feet in diameter at base, and tapering to 2 ft. 9 in. just below the entablatures. They are each secured by four 2-inch holding-down bolts 14 feet long, built into the piers, and terminating below in threaded and nutted ends fastened through 2-inch cast-iron washers 12 inches square. Two tiers of girders give rigidity to the framing. Only the bottom section is counterbalanced; and its counterweights of 3000 lbs. each are prevented from breaking the pier-stones, should they fall, by wooden ties in the column shafts. Guide-rollers opposite the column-rails on each lift, an additional set at the

bottom curbs, and four sets of barrel-rollers on cups and inverted cups, complete the guide-framing.

The auxiliary plant consists of a 30-horse power tubular steam-boiler, and a Roots exhauster, capable of passing 158,000 cubic feet per hour, with engine on the same bed-plate. This apparatus is fitted with a bye-pass, and quick opening valves. A Connelly governor regulates the outlet pressure, while gas is being supplied from this station; and a telephone line 4½ miles long affords communication with the works at Howard Street.

On Dec. 9 the tank was finally filled with water, and the holder tested with air; being found practically tight. It was then partially emptied, and filled several times to insure the satisfactory working of the suspension and guide-framing, after which, on Dec. 12, the air was expelled; the street connections made; and the operation of filling with gas begun. No special main was laid for its supply; the intention being to take gas directly from the street mains in regular use, increasing the pressure at the works during the running of the exhauster and thus maintaining the street supply. This was done; and pressure tests while the exhauster was in action were taken all along the lines of connecting-main—revealing ample pressure everywhere, and the entire absence of oscillation. The Company is now enabled to reduce the night street pressure at the works 12-10ths below their former standard; and though maintaining a low initial pressure at the holder station, to give far greater satisfaction to its western patrons than previously, while it realizes a gain of 1,000,000 cubic feet in storeage capacity.

THE GASES OCCLUDED IN COAL.

In the JOURNAL for the 1st inst., there appeared an extract from a paper read by Professor Bedson on this subject before the Newcastle Section of the Society of Chemical Industry. The conclusions arrived at have been reviewed, in the *Chemical News*, by Mr. W. Ivison Macadam, F.R.S.Edin., Professor of Chemistry at the New Veterinary College, Edinburgh. Mr. Macadam points out that in his communication Professor Bedson, referring to certain gases occluded by coal, states that he has obtained such by placing the coals "in suitable vessels, and exhausting them by a Sprengel pump, and at the same time heating the coal at 100° C. (212° Fahr.), drawing off the released gases by the continual flow of mercury." Many, if not all coals, when heated to this temperature, have a portion of their resins either volatilized or broken up; and the writer has found that the pure resins, when heated, do give off gases of the CH_4 and C_2H_4 series. He is also aware that the composition of coal dust has much to do with its explosive power, and many years ago demonstrated that certain samples of coal dust were explosive in the presence of air and in the absence of fire-damp. The results of the analyses of four resins obtained from the neighbourhood of Kilmarnock and Methil are as follows:—

	Kilmarnock Coal.		Chemise Seam Coal.	
	Soluble in Ether.	Soluble in Chloroform.	Soluble in Ether.	Soluble in Chloroform.
Carbon . .	84·275 ..	74·281 ..	57·497 ..	66·700
Hydrogen .	9·361 ..	6·515 ..	7·527 ..	7·315
Oxygen . .	6·364 ..	19·204 ..	34·976 ..	25·985
	100·000	100·000	100·000	100·000

The only substances already described that the author is aware of, and which are nearly of the same composition, are the mineral resins anthracoxenite and schlanite, as given in Dana's "Mineralogy," and the analyses of which are:—

	Anthracoxenite (Insoluble in Ether).	Schlanite (Soluble in Ether).
Carbon	75·274 ..	81·47
Hydrogen	6·187 ..	8·71
Oxygen	18·539 ..	9·82
	100·000	100·00

Both of these substances are from the coal-beds of Brandeisl, near Schlan, in Bohemia. The author states, in conclusion, that this is a preliminary notice, and that he is now proceeding with the investigations of the resins obtainable from the coal measures.

THE ALLEGED INJURIOUS PROPERTIES OF SACCHARINE.

At last the sole agents for Great Britain of this coal tar product —Messrs. Wilson, Salamon, & Co.—have made a statement on the recent controversy among medicals on the one hand and Government officials on the other, as to the alleged injurious properties of saccharine.

They say: About April last, fears began to be entertained that saccharine might eventually oust sugar from its position as a sweetening condiment; and a crusade was started against it by Dr. Jules Worms, who read a paper before the Academy of Medicine of Paris, in which he urged the vital necessity of protecting the national revenue, agriculture, and industries from the threatened ravages of saccharine, and he said that, in his experience of four cases in which he had administered saccharine, three were affected dyspeptically by its use. Dr. Dujardin Beaumetz followed in the discussion; and, forgetful of the fact that he had only the week previously read a paper before the Société Therapeutique in which he said "he could not too forcibly recommend the use of saccharine," remarked that he had not observed the digestive troubles of which Dr. Worms spoke; on the contrary, all his experience tended in an opposite direction. "But," said he, "as our colleague has forcibly remarked, the considerable sweetening power of saccharine makes it, notwithstanding its high price, a dangerous rival to sugar, and therefore the question of hygiene must exceed that of therapeutics." The criticisms on these statements in some of the leading French papers were so hostile that it was felt more independent testimony was required to convince the public mind that saccharine was noxious. Accordingly, Dr. Worms came to London to interview Dr. Pavey, the celebrated specialist in diabetes, on the subject. He told Dr. Worms that, in his experience of the substance, which was very considerable, he had never observed any evil consequences to arise from its free use. On his return to Paris, Dr. Worms stated publicly that Dr. Pavey, like himself, had observed dyspeptic troubles to arise from the use of saccharine, and had accordingly discontinued advising its employment. This statement being the exact opposite of the words Dr. Pavey uttered, that gentleman published in the *Lancet* of Nov. 3 last an emphatic and indignant denial of the construction Dr. Worms had placed upon his statements; and he wrote at the same time explicitly that, in his opinion, saccharine was not only harmless, but in many cases absolutely beneficial, especially where sugar was contra-indicated. We quote the last sentence of the message of M. Lepère, Secrétaire-Général de la Préfecture de Police, appointing the Commission to report upon saccharine, as it throws very considerable light on the later action of the Government: "The use of this new product threatens the interests of the Treasury, of agriculture, and of the sugar industries. *It is also possible it may injure the public health.*" Naturally, after such a communication, the report of the Commission was adverse, and a Presidential decree was issued on the 2nd ult., prohibiting the importation of saccharine into France; but inasmuch as the order has given grave offence to all except those specially interested in banning the new product, and has to be ratified by the Senate, we are not without hope that such consent may be withheld, in which case the decree must be revoked.

We would like to add that no medical man outside France has ever uttered a word, or given an opinion, otherwise than most favourable to saccharine. Drs. Thomas Stevenson and L. C. Wooldridge, of Guy's Hospital, published in the *Lancet*, Nov. 17, 1888, a report of very exhaustive experiments made with saccharine, with a view to determining whether its dietetic use was innocuous; and the summary of this report was as follows:—"We conclude that—(1) Saccharine is quite innocuous when taken in quantities largely exceeding what would be taken in any ordinary dietary. (2) Saccharine does not interfere with, or impede the digestive processes when taken in any practicable quantity. (3) Our personal experience is that saccharine may be taken for an extended period without interfering with the digestive and other bodily functions; hence there is no reason to think that its continued use is in any way harmful." Such words from such authorities speak for themselves, and need no comment; but we also possess further favourable testimony from the most eminent medical men and scientists of England, France, Germany, and Italy, which, together with the letters and reports above alluded to, you will find in the pamphlet entitled "A Vindication of Saccharine," which we published for the purpose of refuting what we cannot help considering as the perverted and interested reports of the French authorities.

In contradistinction to the action of France, the Dutch Government, who also appointed a Medical Commission to report, have decided that saccharine is perfectly innocuous; and its importation into the Netherlands is officially declared to be allowed. The Belgian and Austrian Governments, acting on the advice of their Academies of Medicine, have likewise decided that there is no reason to prohibit the importation of saccharine into those countries. Thus, if we except the prohibition of saccharine in breweries in this country, the French is the only Government which has decreed its banishment; but it should be remembered that such articles as pork, lucifer matches, and velveteens cannot be imported into France. With respect to the action of the English Government, Mr. Goschen, when he asked Parliament for power to interdict the use of saccharine, specially said that he did so on revenue grounds alone, because, if saccharine were to displace some sugar in the breweries, it would entail a loss of a million per annum to the Exchequer. Inasmuch as to brew beer a fermentable substance is required to produce alcohol, and saccharine is not only non-fermenting but absolutely antiseptic, the value of the argument employed is not very great. Mr. Goschen's action has served not only to prevent the public obtaining a lighter and more palatable beer than can be brewed without saccharine, but prevents brewers employing a substance which is at once a preservative and a flavouring condiment, and which from its very nature could only be used in such minute quantities as not to affect the revenue one iota.

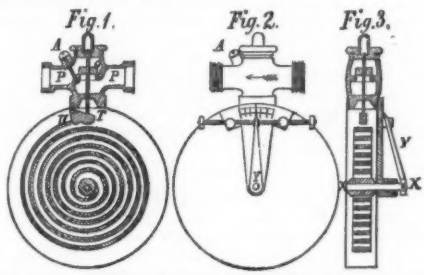
IN our summary for the past year, published in the JOURNAL for the 1st inst., the new four-lift holder at the East Greenwich Gas-Works was described as of 5¼ million cubic feet capacity, whereas, as a matter of fact, it will contain 8¼ million feet.

THE nomination of candidates for the London County Council was made last Thursday. Among the names are very few of gentlemen who are closely identified with the gas and water industries. We note that Mr. J. Beal seeks to represent the ratepayers of Fulham. Mr. C. Horsley, J.P., is desirous of looking after the interests of the inhabitants of Islington East; and the northern division of Islington is to be contested by Mr. W. C. Parkinson. Sir T. Farrer is one of the candidates for Marylebone East; and Mr. Archibald E. Dobbs aspires for a seat on behalf of the southern division of Paddington.

Register of Patents.

AUTOMATIC DEVICE FOR REGULATING THE TEMPERATURE OF ROOMS HEATED BY GAS.—Carter, J. E., of Halifax. No. 1126; Jan. 25, 1888. [6d.]

This automatic device for regulating the temperature imparted by gas heating apparatus is shown in (fig. 1) longitudinal vertical section, (fig. 2) side elevation, and (fig. 3) cross section.



P is a valve-case, Q the valve, the spindle of which bears upon the hinged lever T, against which acts the spring U, composed of two metals of different expansiveness—such as zinc and copper—rendering it sensible to the changes of temperature. The spring is enclosed in a barrel below the valve-box; one end of it being secured to the axle X, which carries a hand or finger Y. The apparatus is connected to the gas feed-pipe of the heating apparatus, by preference near the floor of the room to be heated, where the change of temperature is most effective. As the temperature of the room lowers, the spring contracts, and winds up, whereby the free end operates the lever T, lifting the valve Q and allowing gas to pass through the valve-seat opening to the burner. When the temperature again rises in the room, the spring will return to its previous position; and the valve Q returns to its seat by its own weight. The screw A is for adjusting the quantity of gas passing through the aperture in the valve body; so that the heating apparatus burner will not, when the valve closes its seat, go entirely out. The hand Y and spring U may be adjusted by set-screws to the required temperature as shown on the drawing; and uniform temperature can be maintained with this device, unless a considerable amount of cold air be admitted into the room.

DRY GAS-METERS.—Cloudesley, J. L., of Westminster. No. 1899; Feb. 8, 1888. [8d.]

This invention has for its object the construction of dry gas-meters in such a manner as to ensure, under all ordinary conditions, greater uniformity of capacity, and accuracy in the measurement of the gas passed through them, than in those hitherto used.

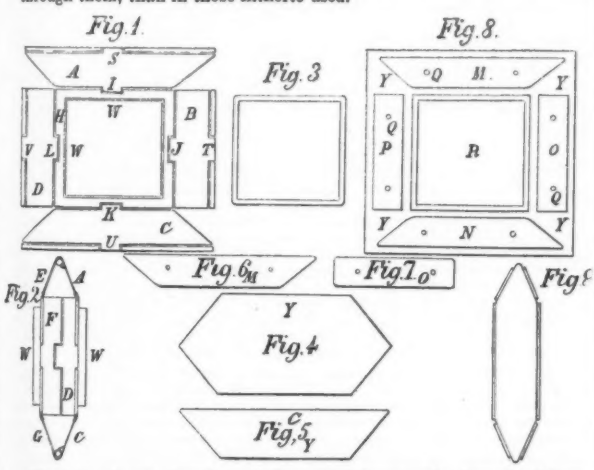


Fig. 1 is a front elevation of the metal framework, formed of four pairs of hinged plates, used to support the flexible leather diaphragm. Fig. 2 is an end elevation of fig. 1. Fig. 3 is a thin metal frame, the use of which is subsequently described. Fig. 4 is the shape of each piece of leather; and fig. 5 is the shape of the same when folded longitudinally. Fig. 6 is the shape of two of the metal cover-plates; and fig. 7 is the shape of the other two metal cover-plates. Fig. 8 is a front elevation of the diaphragm when the leather is attached, and having its cover-plates and central plate complete. Fig. 9 is an end elevation of fig. 8.

The diaphragm of each measuring chamber is rectangular and constructed of a framework of four pairs of plates—A, B, C, D (fig. 1); each pair being hinged together at S, T, U—the corresponding plates on the other side (some of which are seen in fig. 2) being lettered E, F, G. Each of these plates is hinged to a metal rim H at I, J, K, L. The flexible part of each diaphragm is made of four pieces of leather Y, of the form shown in fig. 4, folded longitudinally so as to assume the form of fig. 5, and envelope each pair of plates. Each of the pieces of leather is attached to the adjacent one by sewing their shorter sides together; two of them being somewhat longer than the others, so as to allow of overlapping, and a seam being made. When the framework shown in fig. 1 is enveloped by the leather, the frame exhibited in fig. 3 is passed over the flange W of the rim H (fig. 1, but shown more distinctly in fig. 2). The leather is then turned over the inner edge of the frame, and the flange bent down all round; the leather being tightly compressed between the rim H and its flange W—the frame fig. 3 being inserted between them, to ensure a sound gas-tight joint. On the outside of the leather are fitted cover-plates M, N, O, P (figs. 6, 7, and 8) corresponding in shape, though somewhat less in size than the under plates A, B, C, D; two or more rivets Q being used to join each cover-plate to the under-plate, the leather being between. These cover-plates have their edges curved slightly outwards. The rim H on one side of the diaphragm is fixed to the division plate of the meter; while the other rim is fixed to a central metal plate R (fig. 8), so as to complete one measuring chamber—the other measuring chamber on the opposite side of the division plate being made in exactly the same manner.

FIRE-CLAY GAS-RETORTS.—Terrace, J. B., of Brechin. No. 2322; Feb. 16, 1888. [8d.]

This invention in fire-clay gas-retorts has for its object especially to facilitate the removal of carbon therefrom.

In an ordinary fire-clay gas-retort made with a flat inner end at right angles to the bottom of the retort, the carbon is usually deposited at and adheres to the inner end, and round the retort for a short distance (about 6 inches) from the inner end. The invention consists in forming the interior of the retort with an inclined surface, or with inclined surfaces at and near the inner end. The end may be inclined, so as to form a somewhat obtuse angle with the bottom; or in combination with either a right-angle end or an inclined end, or a partly inclined end, inclined surfaces may be formed round the interior of the retort—such inclined surfaces extending from the ends to a distance of about 6 inches. With the improved shape of retort end, the cake or shell of carbon is (says the patentee) very easily loosened, and comes away as from a mould, without requiring to be previously cut into two or more pieces; and little or no coke remains when drawing the retort.

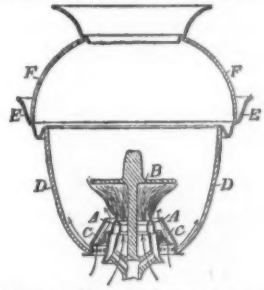
DISCONNECTING GAS AND WATER MAINS AND CLOSING THEIR ENDS.—Helps, J. W., of Croydon. No. 11,914; Aug. 17, 1888. [8d.]

The object of this invention (which it may be remembered was illustrated in the JOURNAL for Sept. 18, 1888, p. 508) is to adopt a method and to construct apparatus whereby gas and water mains may be disconnected with great facility, and without the expense attending their cutting; also to provide appliances whereby the ends of the mains may be effectually closed, and the escape of gas or water prevented.

For the purpose of disconnection, the patentee makes a strong wrought-iron clip in two parts, hinged or otherwise fastened together at the bottom, and of size corresponding to the diameter of the main to be disconnected. The ends of this clip are bent upwards; and each has a hole in it. Between the ends of the clip is placed an iron block or nut, having a hole in its centre and screwed with a female thread. Into this hole is inserted a screw having a head capable of being turned by a wrench or other means. The block is formed with two screwed arms of such size as will admit of their entering and projecting beyond the holes in the upper part of the clip; being secured thereto by a nut on each side. The clip may thus be made to embrace the main very tightly. The mains to be disconnected are laid bare; and one pipe is removed in the usual way. The clip is then attached near the spigot end of the pipe from which the next pipe is to be removed; and a block is placed under the pipe and near the clip attached to the pipe. The screw is then turned until the end rests against the socket of the pipe to be removed; and a chain or rope attached to the short end of a lever is passed round the pipe near its further extremity. A suitable fulcrum being provided, the long end of the lever is depressed and suddenly released as many times as may be necessary, when the pipe will be found to have been loosened and drawn slightly away from the end of the screw. The screw is then turned till its end rests firmly against the socket, when the operation with the lever and the screw is repeated. The repetition of this action will draw the pipe completely out of the socket, bringing the lead with it. To prevent any escape from the ends of mains, a disc of iron of a diameter slightly less than the interior of the socket, is cast with strengthening ribs on one side and a projecting rim on the other. Between the rim and the edge of the disc is placed a ring of indiarubber. This disc is thrust into the socket so that the ring rests against the shoulder of the socket; and upon the application of a screw which works through a bridge-piece or clip (made adjustable to fit different sized mains, so as to embrace the open end of the socket), the disc with its ring may be forced so tightly against the shoulder at the bottom of the socket as to preclude all possibility of escape.

ARGAND GAS-LAMPS.—Chandler, S. & J., of Kennington Oval. No. 12,837; Sept. 5, 1888. [8d.]

This invention, applicable to Argand gas-burners, is designed, say the patentees, so as to allow the usual chimney to be dispensed with, and a better light at the same time obtained. The burner is fitted with a



disc or plate of porcelain of a diameter larger than the diameter of the burner, and at adjustable distance above the burner, which is enclosed within an ordinary globe, as shown in the engraving. A is an ordinary Argand burner. B is the disc or plate of porcelain. C is the cone which is usually placed round Argand burners. D is an ordinary globe. E is a coronet for carrying a dome F. The disc forms a protector against down draught; and causes the flame from the burner to spread outwards in the form of a trumpet mouth or saucer shape at the top. No chimney is required.

PREVENTING THE CHOKING OF THE PIPES FROM THE RETORTS TO THE HYDRAULIC MAIN IN GAS-WORKS.—Mudie, D. P., of Swan Village, near Birmingham. No. 15,407; Oct. 26, 1888. [8d.]

This invention is an arrangement to prevent the choking of the pipes leading from the retort to the hydraulic main in gas-works, by placing in the mouthpiece of the retort, after it is charged with coal and before the lid is closed—but clear of the outlet of the retort mouthpiece—a moveable iron or steel baffle plate or plates.

The working of the invention will be understood from the illustrations.

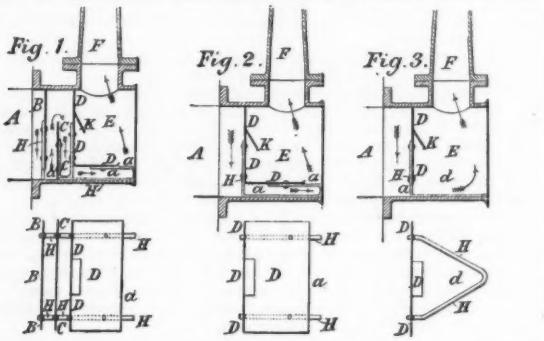


Fig. 1 shows a section of the mouthpiece of a retort and ascension-pipe containing a triple baffle plate placed in the mouthpiece of the retort. It also shows the plan of such a baffle plate. The gas from the retort A passes under the plate B, through the space between the bottom of the plate and the floor of the mouthpiece. The gas then passes over the baffle plate C, and under the plate D, and so into the chamber E, and then up the ascension-pipe F. The plates B, C, and D are attached to a framework H, which projects some distance beyond the bottom of the plate D, so as to keep a passage open between this plate and the lid of the retort mouthpiece.

Fig 2 shows a section of a retort mouthpiece and ascension pipe containing a baffle plate so arranged that the gas coming from the retort A passes through the passage between the bottom of the plate D and the floor of the retort mouthpiece to the chamber E, and thence up the ascension-pipe F. The baffle plate D is fixed on a framework H, projecting some distance beyond the bottom of the plate, in order always to keep an aperture open for the passage of the gas.

Fig. 3 shows a section of a retort mouthpiece and ascension-pipe containing a single baffle plate D. The gas from A passes through the space under the baffle plate to the chamber E, and thence up the ascension-pipe F. The plate is fixed to a framework H, the foot of which projects some distance, in order to keep the plate beyond the ascension-pipe.

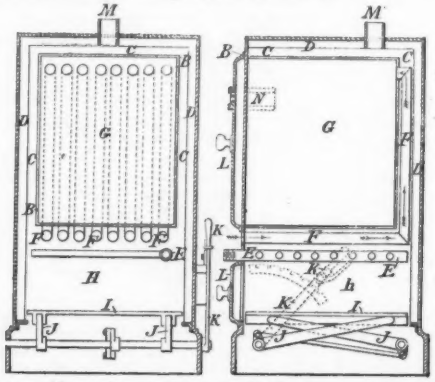
In all three different forms of baffle plates a small projection K is affixed to the front; but in fig. 1 it is only affixed to D. This is placed so that the plate may be taken up and put into or taken out of the retort mouthpiece by the workman with a shovel or other suitable tool.

GAS-ENGINES AND CARBURETTORS APPLICABLE THERETO. Thompson, W. P.; communicated from D. S. Regan, of San Francisco, U.S.A. No. 15,448; Oct. 27, 1888. [8d.]

This invention relates to improvements in combined gas engines, governors, and carburettors. It consists—Firstly, in the construction, arrangement, and application of the igniter, in which arrangement a spring is employed, which makes and breaks the circuit by being placed in such a position that it comes in contact with the piston at each stroke, thus connecting the circuit in the igniting chamber. Secondly, in the construction, arrangement, and operation of the governor, by means of which the supply and exhaust valves are operated once in every two revolutions; or the supply valves may only be operated when the engine is running at as low a speed as is required. Thirdly, in the construction and arrangement of the curburettor which furnishes the gas for supplying the engine in an extremely compact and portable form; thus forming an important feature in a small portable motor available in all places requiring such power.

GAS-OVENS.—Rhodes, S. G., of Leeds. No. 15,556; Oct. 29, 1888. [6d.]

These improvements in gas ovens are illustrated in the transverse and longitudinal sectional elevations appearing herewith.



A is the outside casing of the oven; B, the inner casing; C, the flue space; D, the internal lining or jacketing of any suitable non-conducting material, to prevent radiation of heat; E, the gas-tube and jets forming the burners; F, an arrangement of metal tubes to allow of the introduction of heated fresh air into the interior G of the oven. The air enters as indicated by the arrow; and, on the jets being ignited, an induced current takes place through the tubing—disposed preferably as shown—between the burner tubing E and the bottom of the oven; passing up the back and ends; and making its exit into the interior of the oven at the back, near the top. The space H below the gas jet tubing forms a supplementary oven (relatively to the oven proper G) to allow of cooking by radiated heat. The space is furnished with an adjustable shelf or platform I, which may be raised or lowered by means of the jointed levers J, worked from the lever K, with a spring catch taking into a notched quadrant. This arrangement dispenses with the necessity for loose shelves to be shifted by hand, and allows of perfect command being had over, and the utilization of the temperature according to the requirements in regard to the article to be cooked. The oven is provided with the usual doors L; and is also furnished with a flue or outlet M for the products of combustion. N is a sliding ventilator, to allow of the fumes being carried away from the interior of the oven into the external flue communicating with the outlet.

APPLICATIONS FOR LETTERS PATENT.

90.—RHODES, S. G., "Improvements relating to 'Fire-balls' for use as artificial fuel in gas-stoves and grates." Jan. 2.

121.—BOULT, A. J., "Improvements in or relating to distributing mechanism for gas motors." A communication from Capitaine, E. Jan. 3.

164.—PRICE, W. E., "Improvements in gas-meters." Jan. 4.

196.—SOUTHALL, J., "An Improvement in gas or oil motor engines." Jan. 4.

THE ROBBERY AT THE STROUD GAS OFFICES.—The two men arrested on suspicion with breaking and entering the Stroud Gas-Works, on the 28th ult., and stealing £36 in gold and £10 in silver, the property of the Company, were charged with the offence at the Police Court last week; but the police did not offer any evidence, and the accused were discharged from custody.

NORTHERN COAL TRADE.—There has been more movement in the northern coal trade in the past few days; and with a larger output, the demand has been more fully met. Steam-coal collieries are well employed; and there is a decided stiffness in price. The miners applied for another increase of wages; and to some extent this will have to be conceded, as the contracts which have been entered into have in many cases been at rates based on the assumption that higher prices would be paid for labour. It is too soon to estimate the exact addition to the wages; but it is quite possible that it will be 5 per cent. In the gas-coal collieries, there is now a slight falling off in the local demand, though the fact that the Newcastle and Gateshead Gas Company are selling a million cubic feet of gas a day more than a year ago, shows how the demand for gas increases. Some inconvenience is caused by the stoppage of work at the pits of the Tyne Coal Company; and possibly legal proceedings will be taken against the men. The price of gas coal is steady; and best qualities command about 8s. per ton f.o.b. in the Tyne. It is to be expected that, as contracts at very low prices are worked out, there will be for the new contracts a basis approaching nearer to the price just stated.

THE POLLUTION OF THE THAMES AT WEYBRIDGE AND CHERTSEY.—In his last published report, the Water Examiner for the Metropolis (Major-General A. De Courcy Scott) recalls the fact that in his report for the month of September reference was made to the fact of the growth and extension of sources of pollution to the River Thames in the neighbourhood and above the intakes of the London Water Companies. In the course of an inquiry held by direction of the Local Government Board, at Weybridge, on the 29th of November, evidence was given which illustrates forcibly the condition, from a sanitary point of view, of too many of these riverside towns and villages. The inquiry related, he mentions, to a proposal of the Rural Sanitary Authority of Chertsey to borrow a sum of money for the purpose of constructing works of sewerage and sewage purification for Weybridge and Oatlands. Evidence was adduced to the effect that the houses drain into cesspools, and that the overflow from these passes in a number of cases into the road drains, and thence into the Wey close to its junction with the Thames; that large cesspools unsealed, and the contents of which pass away into the sand, are situated close to the former rivers; and, moreover, that a depôt for the collection of the contents of the cesspools has been established 20 feet only from the Engine river, which falls into the Thames. It was also shown that Chertsey was in a similar condition, and was a source of pollution to the river.

BILSTON GAS COMPANY.—The annual meeting of this Company was held on Monday last week, under the chairmanship of Mr. T. Holcroft. In moving the adoption of the report (*ante*, p. 23), he spoke of the works having been carried on satisfactorily during the past year, and to their having been kept in repair. The previous year the income was about £800 less than was required to pay the dividends, and the price of gas was advanced. But this year there was a balance of about £1000 over the sum required for dividends; and the charge for gas to the consumers had therefore been reduced to the old price. With regard to the accounts, he said it would be seen that there was an apparent saving of £700 in the cost of coal. Their last contract for coal covered a period of a year-and-a-half; but it was expected that the next contract would show a rise of 2s. to 3s. per ton. Against this it was hoped that the prices of residuals would advance, and that there would be an increased consumption of gas. The works were being extended; and he was glad to say more gas was being consumed. They had, therefore, reason to believe that the dividends were assured for the next few years. If the present state of things was continued, he hoped they would be still further able to reduce the price of gas. The Directors were very desirous of making such a reduction, because there was no doubt that progress was being made in the development of the electric light, and it was desirable that the Company should put themselves in a position to compete with it. This could only be done by selling gas as cheaply as possible. The motion having been carried, the Rev. C. Lee moved that dividends making with the interim dividend 10s. and 7s. per share for the year on the old and new capitals, be paid. He referred to the affairs of the Company as being in a most satisfactory condition, and said the increase in the consumption of gas had been going on ever since the improvement in trade set in. Personally he had no fear of the electric light competing with gas, unless some new invention to make it more popular were discovered. He thought they had more to fear from the competition with petroleum and oil lamps. A great increase in the consumption of gas would take place if artizans could be induced to introduce it into their houses. He pointed out that the loss from leakage was not so great as formerly; and expressed the hope that the Company would not only be able soon to reduce the price of gas, but increase the dividends.

Correspondence.

[We are not responsible for the opinions expressed by Correspondents.]

MR. BRAY AND THE COMMISSION QUESTION.

SIR,—By the copying of a certain letter in this week's JOURNAL, prominence has been given to the following statement:—

> (d) I trust the members generally, who have suffered so much by every move in the policy of the late wire-pullers, *even to the extent of having been repeatedly denounced at public meetings by Mr. Geo. Livesey*, the leader of those wire-pullers, and *by the reptile organ of the clique as being almost universally corrupt*, will not aid them," &c., &c.

If the words I have italicized (or their equivalent) had been used by you or me, they would have been grossly unjust, if not seriously injurious to a large and honourable body of men engaged in the gas industry; and, in their interest, it is necessary to say that neither you nor I have presumed to pass any such judgment on our fellow men.

I have spoken at public meetings on the subject in question on two occasions; and the reports of what I said will be found at pages 280 and 292 of the JOURNAL for Feb. 14 last. To these passages I refer anyone interested in the matter, where he will find no such statement as that above quoted; but, on the contrary, that in my opinion the gas profession contains a large proportion of honest, fair-dealing men.

Tunbridge Wells, Jan. 11, 1889. GEORGE LIVESEY.

[The attempt to mix up the question of illicit commissions with the movement for the formation of a truly representative Association of Gas Engineers is artfully designed; but is a little too glaring for success. Misrepresentation of his opponents' words, and aspersion of their motives, are too common methods of Mr. George Bray's to require particular notice. What we have written, we have written; and while accepting full responsibility for it, we prefer to rest upon the words themselves rather than to notice any gloss that an avowed enemy chooses to place upon them.—ED. J. G. L.]

THE GAS INSTITUTE.

SIR,—If you consider the matter of any interest, please publish the enclosed copy of a letter sent to a contemporary to contradict a assumed position of the members of the South-West Association—which, as an individual member, I do not agree with. Therefore this may be the reason of its non-publication.

Southampton, Jan. 12, 1889. S. W. DURKIN.

[ENCLOSURE.]

The Editor of the *Gas World*. *Jan.* 9, 1889.

Sir,—In looking through your impression of the 5th inst., I lighted on an article headed "The Prospects of The Gas Institute," wherein it is stated "for we are assured that the South-West of England Association . . . . supports the Council to a man." As we have had no meeting of the above Association since September, and the relationship of its members to the said Council was not brought up for discussion, and as far as I am concerned I have received no official communication on the subject, I consider your informant must be possessed with too much assurance on the point named. I purpose remaining a member of the Institute, to have a voice in the eviction of the trade element (with all due respect to them), for this has been the root of the evil; and if the remnant of the Council make this a part of their programme, so far they will have my support, and as the rule has worked well in the South-West of England Association, I believe it would in the larger Association.

Yours faithfully, S. W. DURKIN.

SIR,—I have read your editorial comments upon this subject, in the issue of yesterday, with no slight interest. With part I agree, with much I do not; and it is to the portion to which I object that I would direct your attention.

I have nothing to do with the dispute of Mr. George Bray with the members of The Gas Institute who have resigned their membership; but I certainly think had Mr. Bray had fair play, there would have been no dispute. Although he has had a hard fight for it, I am bound to admit he has had up to the present, and it appears he is likely to have, the best of the fight, and the sympathy of all right-thinking men—men who are not to be led by the nose by the heads of a clique; but men who have opinions of their own, and a desire to express them. The Gas Institute was fast becoming—if it had not already become—the happy hunting-ground of a few choice spirits, who looked upon the majority of the members as mere puppets. The policy of the clique was unquestioned and paramount; and it is to that policy that the present position of The Gas Institute is due. It was an unwise policy, an unjust and unfair policy, in every way. The new Institute, if ever it comes into existence, is to exclude traders. Exclude traders! Why, it is the trading element among the gas engineers and members of the Institute that has worked the ruin of the institution—the gas engineers who are in some way or other connected with trading companies, either as shareholders, directors, or in some way too often only known to themselves. It is to these men, who expect a share in the profit of any order they give, or influence, from the gas-works they represent, and who encourage the system of tips or commissions (or profits in some way) that is due to-day the unfortunate position of The Gas Institute. I am bound to say this element is very much reduced by the recent resignation of certain members of the Council. Get rid of it altogether, and The Gas Institute will flourish, and be beyond the reach of a reproach or a sneer. Begin another Gas Institute on the same lines as the present has been conducted the past ten years, and it will not last, nay, cannot, and shall not, as many months.

On the first morning of the Institute meeting, in June last, I was asked to attend the meeting, more expressly to hear the promised paper on "Commissions" read. I was very anxious upon the matter, and sought counsel of one of the *then* guiding spirits of The Gas Institute. That gentleman will remember what I said. In substance it was: "Get rid of the whole system of tips and commissions, and let each member pledge himself that, whatever has been done in the past, every individual member will do his utmost to stamp it out in the future; and let the Institute use its influence in getting better salaries for its poorer paid brethren; but denounce the tip and commission system, and expel any member who shall accept commissions, or have any benefit, directly or indirectly, from any business done by his company." The reply received from this leading light was: "Oh, they all do it." I said: "I do not believe it; but know that if the Institute does nothing but damn the whole commission system (as the whole business of its meeting), it will save itself." I further said: "Depend upon it, there is a wave of public opinion gathering which will knock so loudly at your door that it will wreck the Institute." My protestation was treated contemptuously. The paper on "Commissions" was never read. We know all the rest; and we view The Gas Institute deserted by those who have been the main cause of its ruin.

Why should not The Gas Institute, as it at present is, rise nobly out of the disasters and mistakes of the past, and be, as it deserves to be, the representative Institute of gas engineers of the three kingdoms who desire that their profession shall, in the future at least, be free from the taint of corruption, to the exclusion of all who will stick to the commission system, or their connection with some trade or business doing business with gas-works for their own particular profit? This principle should form one of its great rules.

As to who suffer most by the manager having an interest in a trading company, I will give an instance within my own knowledge. An article was purchased by a manager from certain people, to the entire exclusion of any other traders. That article cost the gas company from £5000 to £6000 per annum for many years. The new manager has no such connection with a trading company; and he manages to get all he wants for a little over £1000 per annnm. Who suffers most by this rascally system? Why, the gas manager's employer. Be it a private concern or public company, it is the same. All employers of gas managers should insist that they be free from taint of this kind, and pay them well both in salary and a percentage on the profit of the gas undertaking, whatever it be.

An Institute founded on these lines, determined to give fairplay to all, will stand, and be a credit to the industry it represents. Otherwise it will go to pieces in disgrace. As to papers, let all who desire to read papers, and who choose to prepare them strictly themselves, come to the front; but let us have no more shining lights arrogating to themselves the honour of reading papers written for them, and thought out by better brains than their own. The greater the desire of its members to let in the light, the more will it deserve and win the public esteem. Otherwise it will bear the reproach levelled at the Institute for the past ten years, as being an institution representing the few to the unhealthy exclusion of the many.

If there are gas managers foolish enough to think they can do as they like in the future, they are doomed to an unpleasant awakening.

Forest Hill, S.E., Jan. 9, 1889. SAMUEL HAYWARD.

INCREASED FACILITIES FOR GAS CONSUMPTION.

SIR,—My Committee have under their consideration a report of mine on introducing pipes and fittings to houses not at present supplied with gas, so as to give greater facilities for its use—feeling, as I do, that the greatest drawbacks to increased consumption are the first cost for fittings, and the deposits at present demanded from intending consumers.

We have in Ramsgate 4700 houses, only 2200 of which are fitted up for gas; leaving 2500 still to be supplied. Of this latter number, there are 1000 houses with an average rental of from £15 to £30; the remaining 1500 being cottages from £8 to £12 per year.

My proposition is as follows:—(1) Fit up any house with iron pipes free of cost, for persons desiring a supply. (2) Supply gas-fittings to those persons at (say) an annual rental equal to 10 per cent. of their cost. These fittings to consist wholly of brackets or side-lights, and not to include gasaliers or fittings of a more expensive type. (3) Instead of demanding a deposit from those having a supply in this way, to give them the alternative of paying monthly. These monthly accounts to be collected by what I shall call a "Collecting Inspector" for two months out of the three; the third month the index to be taken—and account rendered, in the usual way. All accounts of this class to be payable on demand—that is to say, at the moment the meter is taken, and if not paid at the office within seven days, the gas to be disconnected. (4) I also propose to lend free of cost to any consumer desiring it, a small boiling-ring. A thousand of these at 1s. 3d. each would amount to £62 10s. only.

Leaving out of consideration for the moment the cottage property, the houses from £15 to £30 per year rental would cost an average of (say) £4 per house for iron pipes. Supposing that the whole thousand be fitted, the total cost would be £4000, the interest on which, at 5 per cent., would be £200 per annum. The increased consumption of gas for these 1000 houses, taking the average during lighting hours at 10 feet per hour per house, would be about 20 million cubic feet per annum.

It need only be pointed out that, although doubtless it would be some considerable time before the whole 1000 houses would be fitted, no expenditure would be incurred without an immediate proportionate return being made; as, of course, houses would only be fitted up as applications were received from intending consumers.

For the present I leave the smallest or cottage property, as I believe should the same liberality be extended to such property, it could only be done by the introduction of some reliable prepayment meter, or some system of weekly payment, which I am not at the present time prepared to deal with.

I submit my views with the object of ascertaining whether the engineers and managers of other companies and corporations are doing anything of the kind; and, if so, whether it has resulted in success or failure.

Ramsgate, Jan. 10, 1889. WILLIAM A. VALON.

THE ELECTRIC LIGHT AND VENTILATION.

SIR,—The very excellent letter of Mr. Vivian B. Lewis, in the current number of the JOURNAL, is one which every gas engineer, manager, or director would do well to read, mark, learn, inwardly digest, and act upon. Unfortunately, if the experience of the past ten years may be taken as a criterion, there appears but little hope of their doing either, until they are roused at last from a stupor almost culpable, by having

to explain the why and wherefore of a decrease in their last half-year's consumption, instead of "the usual satisfactory increase."

As Mr. Lewis truly points out, electricity has taken the field, actively and with supporters picked and fresh for the fray, against its rival gas. And to the question, "What are gas companies and corporations doing in a matter so vital to their interests and their existence?" there seems but one reply—"Practically nothing." For I hold that in face of a rival more potent and more powerful every day, reductions in price must be looked upon *not* as the end in view, but simply as the means of emphasizing that end.

Educate! educate! has been oft-propounded as a remedy for our many social ills, by the wisest of our thinkers. Educate! educate! may well be taken as a motto by our present engineers in dealing with their consumers. Teach them that lighting by electricity will neither make their houses nor their churches, their halls nor their theatres, as fresh or as healthy in their atmosphere as gas when properly applied (and this too, be it borne in mind, at one-quarter the cost); and gas will become the idealization of the scientist's dream for supplying light and pure air to them all. I speak by the book; for I have endured the stuffiness of a living-room certainly made less dark, but not less stuffy by the mystic current. And the remarks of my biped visitors have been but emphasized by the existence of the mute plant-life around, of the wondrous change in atmosphere a prosaic ventilating "Cromatic" gas-lamp has brought about.

Place this knowledge of the few at the service of the many; fit up their houses with the newest and best burners of the most approved types, making that at least as important a part of a gas engineer's functions and duties as the striving after an impossible number of tons of coal purified by a yard of lime, or the *reductio ad absurdum* of his cannel percentage—and gas consumption will I firmly believe advance, not by driblets of 3 or 4 per cent., but by leaps and bounds, to an extent now undreamt about.

Vauxhall, S.W., Jan. 12, 1889. CHAS. C. CARPENTER.

THE HALIFAX GAS SCANDAL.

SIR,—We enclose a letter from Mr. Carr hereon, to which we hope you will give publicity.

Halifax, Jan. 8, 1889. STOREY AND CO.

[ENCLOSURE.]

SIR,—Will you allow me space in your paper for a few observations on the so-called "Gas Scandal." As I am about to leave Halifax, I think it only fair that I should point out to the ratepayers, or at least to such of them as have had the hardihood to believe in me, a few flagrant inaccuracies in statements that have been current during the past few months.

In September last I was asked to commence an action against the *Pall Mall Gazette* or resign. That it would come to this I had known for some time. I had repeatedly been requested by the Town Clerk to consider whether it would not be better for me to take such action of my own free will, before (as he put it) I was compelled to do so by a resolution of the Council. I had so considered it; and had been advised not to take action. The matter was again put to me by the Mayor (on behalf of the Sub-Committee), who said: "If you don't take this action you will have to resign;" the Town Clerk remarking that if I came out all right, the Council would not see me lose anything. After considering the matter for a few days, I saw the Mayor again, and told him that I had decided not to take action, as I was afraid to enter upon an expensive lawsuit, which might, by any fluke or miscarriage, involve me in financial ruin. Also that my state of health was such that I should prefer to give up my situation, if that was the only alternative. I would like to say here—and Mr. Storey will bear me out—that a complete indemnity was never mentioned until after I had finally refused to take action. If it had been offered, it was worthless to me, for it simply meant, "If you succeed, and get damages, you will not require help. Under those circumstances, we shall be prepared to help you. If, on the other hand, you fail, and have to pay costs, we shall regard you as guilty, turn you out of your situation, and leave you with the whole of the expenses to pay." Therefore, I had to leave the question of indemnity (about which so much spread was made in the Council Chamber) out of consideration altogether, and be guided by my legal advisers, on the merits of the question pure and simple. So far, the Town Clerk is the only lawyer whom I have ever heard of saying that I had a case; and I had not sufficient confidence in his opinion to risk money on it.

At the Council meeting of Oct. 3, the Mayor told the Council that I had given it as my reason for not taking action, that I was afraid to enter the witness-box. To this statement I give the most emphatic denial of which I am capable; there is not one word of truth in it. He also stated that I had received bribes to a considerable extent; and that they could prove it up to the hilt. That this was untrue has been proved by his subsequent conduct, as one scrap of evidence of that character at Leeds, would have been worth all the experts' opinions in the world. He also made something of the fact that a large proportion of the coal was not weighed; leading the Council to infer that I, in collusion with others, had robbed the Corporation by admitting short weight. Two-thirds of the coal that he complained of had been received during my absence the previous winter. That we could not weigh the whole of the coal was a fact perfectly well known to every member of the Gas Committee. Every Christmas we gave Christmas Boxes to the railway officials (guards, drivers, &c.) for the purpose of getting their goodwill; and a year rarely passed round but some member of the Committee asked for an explanation of this, and they were told it was for the purpose of getting as many coals weighed as possible. But the Mayor's greatest surprise was that they had received cannel of 2s. 6d. per ton inferior quality to that contracted for; and had thus been defrauded out of thousands of pounds. Notwithstanding this, the Corporation went on taking this cannel to the end of October, and I believe into November. They had the September account in hand at the time the Mayor was speaking; but they paid it in full, and so on to the last pound taken in November. To the present time they have taken no action to recover the thousands of which they allege they have been robbed; but, in order to make a show of doing something, they broke the contract in November in a rising market, and have since bought a worse material at a higher price. The Mayor has stated more recently that coals were found to have been in stock five or six years. I can only say that it is a matter of surprise to me. But however long the coal had been in stock, it was all worked out early in November; so that it was wrong for him to say that the bad gas made in December was due to this cause. Every member of the Gas Committee, as well as the Mayor, knew that they had been working from hand to mouth during the whole of December.

At the commencement of this agitation, the Mayor paid me the most fulsome compliment of any member of the Council. Since that time he has (acting under the inspiration of the Town Clerk and Mr. Ellis Lever, to whom he gave a private and confidential interview) pursued me with a virulence and enmity so bitter that I am at a loss to understand it. I have served the Corporation for over thirteen years; and have been honoured and respected in the town. All this is blown away by one breath of a man, a stranger in the town. As a servant of the Corporation, I have tried to do my duty, and have been fairly successful as far as results go, which I feel proud to say will remain as an ineffaceable monument of the quality of the services I have rendered. It may be that I have not always given the best advice possible to the Gas Committee, and that I have erred in judgment at times. It would be strange if it were otherwise; but I have never at any time sacrificed the interests of my employers for any money consideration. My punishment has been great, and out of all proportion to any errors I may have been guilty of; but I would rather be the sufferer I am, than have it on my conscience that I had wronged any man, as the Mayor has wronged me.

With regard to the report submitted to the last Council meeting, I can only say that Mr. Paterson is not a Civil Engineer any more than Mr. Hayward. He is, or was, a Gas Manager. He has been a Gas Manager probably more years than I have lived; and I should think that one ounce of his practice, as such, in the way of comparative results, would be worth a ton of his opinion on the work that I have done. The lowest price at which he could ever supply gas was 3s. per 1000 cubic feet, as compared to 1s. 9d. at Halifax. The results obtained at Halifax so far exceed anything he has been able to accomplish, that they amount almost to a revelation to him. If the Corporation here have lost £25,000 by my bad advice, what must the Corporation of Warrington have lost during the same period?

In conclusion, I would like to point out that at the end of the first half of last year, the Halifax Gas Department showed a balance profit of £2000. In the ordinary course of things, the second half of the year ought to have exceeded the first. The profit for the year, therefore, ought to be between £4000 and £5000, without taking into account the surplus stock of coal, worth £500. The Committee should thus be in a position to reduce the price of gas to 1s. 7d. per 1000 feet, and still have a safe margin to work on. Now, if they save the £4000 said to be thrown away on the last coal contract, it would allow of a further reduction of 2d., and would bring down the price to 1s. 5d. per 1000 feet. This will be the outcome of the change of administration, and does not take credit for any of the improvements which are to be introduced at the works. It will, of course, take some time before the results of the latter can be shown; but when they are brought out, they will go a great deal further than the unfolding of any number of tales.

Halifax, Jan. 8, 1889. WM. CARR.

GAS AFFAIRS AT LEEDS, HALIFAX, AND SALFORD.

SIR,—I have read your comments on the above, in the issue of yesterday. Of Leeds I know nothing beyond what I read; but with the two latter towns—Halifax and Salford—I am acquainted, and can speak with a little authority.

I think the evidence which the Mayor of Halifax had could not have been damaged by any cross-examination, or by the unmasking of the battery alluded to. Messrs. Storey and Mr. Carr have had the opportunity for the past fortnight of tackling the coal-contract report, every figure of which has been before them for three weeks or more. All they found to complain of is a mistake of their own, and not the greatest—viz., that the constituents in an analysis are 131 lbs. over what the weight of a ton of coal should properly be. If Messrs. Storey desire it, I could show them a few more of their client's analyses which had greater inaccuracies, and in the wrong direction. The report on the coal contracts is based principally upon the analyses of Mr. W. Carr, which should be correct. If they are not correct, will Messrs. Storey tell us why incorrect?

With respect to Salford, Mr. Lever may, or may not, make something out of his allegations; and I agree that it would be well if the Salford Gas Committee were permitted to address themselves to the future; but first of all they should clear up the past a little better, in the interest of the ratepayers of Salford, than they have yet done.

Forest Hill, Jan. 9, 1889. SAMUEL HAYWARD.

SPUR-WHEEL GUIDING FOR GASHOLDERS.

SIR,—Your article, entitled "Spur-Wheel Guiding for Gasholders," calls, I think, for some notice from me, as it appears to place me in an entirely negative, or, at least, secondary position with regard to that invention.

I am far from desiring to detract in the slightest degree from the merit attaching to Mr. James B. Terrace in independently hitting upon this idea. But if it is assumed that he did this *prior* to myself, a great misapprehension exists; and it becomes necessary to repeat what has been fully stated to Mr. Terrace—viz., that I formulated the method of geared wheels, identically as laid down in your article, whether the same be fixed round the tank, or attached to the bottom curb of the holder (and also in other variety, not named by you or Mr. Terrace), very soon after I had applied for protection for my spiral guides—at the latter end of 1887; and that in the beginning of 1888 I had various drawings thereof prepared by my draughtsman, as well as numerous sketches by myself. Later on, I laid the matter before my colleague, Mr. Mason, and some months ago we discussed the advisability of protecting the same, or risking further delay. We decided on further delay, for the purpose of avoiding any distraction of attention from the spiral guides, until such had received full discussion.

Now, Sir, as I made this invention something like a year prior to when Mr. Terrace states he made the same, I fail to see the justice of any suggestion of priority for him; or, when two persons have hit upon the

same idea, that the credit should appear as exclusively given to the latest discoverer.

Our application for protection was filed in London on Dec. 12, and so left this city on the 11th, which was two days prior to the earliest moment I became aware of what plan Mr. Terrace was proposing for the purpose; and I feel sure that gentleman, as well as yourself, will desire to take care it is not assumed I had any knowledge of his plan earlier than the morning of Dec. 13, 1888; and I certainly never heard of it from any other person or source whatsoever. The slight discrepancy of date alluded to did not affect the matter, and primarily arose from my continued ill-health, and was fully explained.

I will add that a draft specification of the invention had been kept all ready for several months, should occasion require. The decision to delay filing was slightly against my individual judgment; although I fully saw the wisdom of my colleague's reasons therefor. Having thus shown that I have many months priority of actual invention, and a distinct legal priority of patent-right, I am sure you will readily accord me my fair share of credit in this matter.

Of course—as already expressed privately to him—I have every proper sympathy with Mr. Terrace in his disappointment; but his is by no means the first (or even an uncommon) case of the kind. Indeed, I have more than once been placed in identically the same position, as where there are two independent inventors of the same thing, one must take precedence of the other.

Nevertheless, I am not so enamoured of the invention as Mr. Terrace (and, from your remarks, Mr. Livesey) would appear to be. For, although I have invented and protected the method referred to, I cannot at present advise its adoption for other than very small holders; for the simple reason that the whole of the transverse strain on the holder, arising from wind-pressure, would have to be taken up in *torsion* of the ring of geared wheels and shafting.

If we even suppose the teeth of the wheels to stand the strain, with a 100-feet diameter holder only, the torsion of the shafts, unless of enormous strength, would be such as to allow of a considerable tilt, which I for one, with my present views, should not care to risk.

W. Gadd.

Manchester, Jan. 10, 1889.

WEST'S STOKING-MACHINERY.

Sir,—I should like to be allowed to say that the credit of the original idea for working stoking-machinery by an endless travelling rope (a system which my friend, Mr. West, has brought to so excellent a state of perfection), belongs to the late Mr. S. Warren, of Crewe.

In conjunction with Mr. P. J. Wates, a combined charger and drawer was erected at Greenwich, worked and traversed by an endless-rope, driven from a stationary engine at the end of the retort-house; the power being applied therefrom at will, by means of friction clutches.

The system is so clearly an advance on that requiring the transmission of its power by hydraulic or compressed air, or the still more cumbrous one of a portable steam-boiler, that it is surprising it has not ere this received the attention it so well deserves.

Chas. C. Carpenter.

Vauxhall, S.W., Jan. 12, 1889.

GAS GOVERNORS.

Sir,—In this week's issue of the Journal, on p. 71, is an illustration of a gas-governor valve, as patented by Mr. J. K. Bartlett, of Battersea, London. I am sorry he has put himself to this trouble, as I have a 2½-inch governor of that pattern made early in the year 1884, with an annular water compartment to seal the bottom of the valve, and the gas passage comes up in the centre, all as shown.

I prepared drawings to use the hollow cylindrical valve with conical top, as shown in the engraving, and reversing this, placing the face of the moving valve bevelled inwards, and the conical portion pointing downwards on a fixture over it. I also had the valve to rise up and touch the seat without any conical form. This valve I styled my single-beat valve, in contradistinction to my patent double-beat annular valve.

A copy of correspondence with a French company, dated April, 1884, about the manufacture of this single-beat pattern (with sketches) is in my possession; and also a letter to a gas engineer, dated July 10, 1884, with a sketch showing how a 16-inch and an 18-inch ordinary cone-governors, which gave trouble by pulsations, could be altered to my then new pattern.

Should Mr. Bartlett wish a representative to see these, I will gladly show them when desired. My having made and used one some years ago, the priority is established, and the patent so far as the valve is concerned, is void.

William Key.

Glasgow, Jan. 11, 1889.

GAS SUPPLY IN JAPAN.

Sir,—Under the above heading, a letter appears in your issue of the 16th of October.

Your correspondent is labouring under a false impression as to the value of Japanese money. A Japanese yen or dollar (silver or paper) is equivalent to 3s. 0½d., according to the current rate of exchange; but for purposes of comparison, it is only fair to take the average of the past few years—viz., 3s. 2d. Gas at 2 yen 70 sens per 1000 cubic feet, instead of being equal to 10s. 9d. per 1000 cubic feet, as stated by your correspondent, is only equal to 8s. 7d. per 1000 cubic feet, with discount according to amount consumed.

Wm. Newbigging.

Gas-Works, Tokio, Dec. 7, 1888.

THE GAS ENGINEERING STAFF AT MANCHESTER.

Sir,—I note, in a letter signed "Lux," it is stated that the Manchester Gas Committee, in one of their economical moods, moved a Manager (or as, if at Birmingham or London, he would be termed Engineer) from the Gaythorn Gas-Works to some other works, and brought in an "old servant" to attempt to perform the duties for £200, that had previously been paid £500 for. I wonder if "Lux" knows this "old servant." I do; and think if "Lux" had known him as long as the writer of this letter has had the pleasure of not only knowing him, but knowing much of the work he has done for the Manchester Corporation Gas Committee, "Lux" would have hesitated before applying the word "attempt" in the manner it has pleased him to put it. Let me ask "Lux" if he ever went through the Rochdale Road Gas-Works prior to 1859, and again in or about 1874. If so, did it ever strike him that the transformation of those works could not have been carried out by a "duffer?" Again, does he consider the two triple-lift holders in Newtown the work of a man who understands his business, or one who has to learn it, as the word "attempt" implies?

Fairplay.

Jan. 10, 1889.

BOARD OF TRADE RETURNS AS TO GAS UNDERTAKINGS.

Sir,—The above-named returns were issued to the public yesterday. I have sent a copy of each return to the subscribers to the Association, and to all others who had previously requested me to do so; and if they have not been duly delivered, I will forward others on being informed thereof.

The cost of one copy of each return, including postage, &c., will be 1s. 8d.; and I will forward copies to any person requiring them upon receipt of this amount.

Wm. Livesey.

79, *Palace Chambers, Westminster, Jan.* 11, 1889.

ESTIMATING THE COMPARATIVE VALUE OF COALS.

Sir,—The data as below, given in Newbigging's "Handbook," for arriving at the comparative values of different coals, is misleading, and, in fact, inaccurate, as the fictitious value attached to the pounds in sperm gives a wrong ratio.

No. 1 Coal, quoted at 12s. 6d. per ton, producing—	£	s.	d.
10,600 cub. ft. of 17¼-candle gas = 636 lbs. sperm . . . . . at 1s. =	31	16	0
13½ cwt. of coke . . . . . at 5d. =	0	5	7½
10 gals. of tar . . . . . at 1½d. =	0	1	0½
22 gals. of liquor . . . . . at 1d. =	0	1	10
	32	4	6

No. 2 Coal, quoted at per ton, producing—			
9700 cub. ft. of 16¾-candle gas = 557 lbs. sperm . . . . . at 1s. =	27	17	0
14 cwt. of coke . . . . . at 5d. =	0	5	10
9 gals. of tar . . . . . at 1½d. =	0	0	11½
20 gals. of liquor . . . . . at 1d. =	0	1	8
	£28	5	5½

Then, if No. 1 is worth 12s. 6d. per ton, No. 2 will be worth

$$\frac{\text{£28 5s. 5½d.}}{\text{£32 4s. 6d.}} \times \text{12s. 6d.} = \text{10s. 11·6d.}$$

But, calculated as below, on a more practical basis, No. 2 is shown to be worth 11s. 3·71d.—4d. more than by the foregoing figures.

No. 1 Coal—	£	s.	d.
10,600 cub. ft. of 17¼-candle gas = 9275 ft. of 20-candle . . . . . at 2s. 10d. =	1	6	3½
Coke, tar, and liquor, say	0	8	6
	1	14	9½

No. 2 Coal—			
9700 cub. ft. of 16¾-candle gas = 8124 ft. of 20-candle. . . . . at 2s. 10d. =	1	3	0½
Coke, tar, and liquor, say	0	8	5½
	1	11	5½

Then, if No. 1 is worth 12s. 6d., No. 2 will be worth

$$\frac{\text{£1 11s. 5½d.}}{\text{£1 14s. 9½d.}} \times \text{12s. 6d.} = \text{11s. 3·71d.}$$

Would not the cubic feet per ton, reduced to a standard of 20 candles, be a better basis than the pounds of sperm? It would, I think, be more practical, and not so far-fetched.

Thos. M'Dermott.

Stalybridge, Jan. 10, 1889.

[Probably our correspondent may have some weeks to wait for a reply to his letter, as Mr. Newbigging is still away fulfilling a professional engagement in South Africa.—Ed. J.G.L.]

Darwen Corporation Water Supply.—A Sub-Committee has been appointed by the Darwen General Purposes Committee to make negotiations for, and report upon the best scheme for obtaining a further water supply.

New Companies.—A Company has been registered, under the title of the "Improved Gas and Coke Manufacturing Syndicate," to carry on, at home and abroad, the business of gas and general engineers, gas, coke, and chemical manufacturers, gas and general contractors and manufacturers or dealers in every description of machinery. The capital is £10,000, in £1 shares.——The Newcastle-on-Tyne Electric Supply Company has been registered, with a capital of £50,000, in £5 shares. The object of the undertakers is to supply electricity for lighting and any other purpose in Newcastle-on-Tyne and elsewhere within the counties of Northumberland and Durham.

Defrauding the Nottingham Corporation Gas Department.—Last Tuesday, H. Raynor was charged at the Nottingham Summons Court with stealing 1000 cubic feet of gas, valued at 2s. 6d., the property of the Corporation. It was asserted that defendant had also previously used gas for which he did not pay; and that there was every reason to believe he had been consuming gas on the present occasion for some two or three months. The gas was cut off from his premises; but the house pipes had been again connected with the service-pipe by means of a piece of indiarubber tubing. The defendant, who pleaded guilty, denied that he had used the gas longer than from the 24th ult. Taking into consideration his poverty, the Bench only inflicted a fine of 20s., or fourteen days' imprisonment.

The Supply of Water at Fires in the Metropolis.—In his report on the work of the Metropolitan Fire Brigade during the past year, Captain Shaw states that the quantity of water used for extinguishing fires in the Metropolis in the twelve months has been just nine million gallons, or about 40,100 tons. Of this quantity, something like 13,000 tons, or nearly one-third of the whole, was taken from the river, canals, and docks; and the remainder from the street pipes. During the year there have been 19 cases of short supply of water, and five of late attendance of turncocks; making altogether 24 cases in which the water arrangements were unsatisfactory. As long as there is an intermittent supply of water, cases of this kind are certain to occur; but, in justice to the Water Companies, Captain Shaw says that it is right to state that they appear to make every effort in their power to obviate the difficulties inseparable from the present system.

Legal Intelligence.

GREENWICH POLICE COURT.—SATURDAY, JAN. 5.
(*Before Mr.* MARSHAM.)

GREENWICH VESTRY *v.* THE SOUTH METROPOLITAN GAS COMPANY.
A RATING CASE.

This was a summons calling upon the South Metropolitan Gas Company to show cause why a distress warrant should not issue in respect of rates. The Company contended that the rate was invalid; and they disputed the legality of the list on which it was made.

Mr. T. J. SMITH, the Rate Collector, represented the complainants; Mr. W. C. RYDE appeared for the Company.

Mr. SMITH produced the rate-book, showing that the Company were rated for £1237 10s.; that the rate had been duly made and allowed; and that application had been made for the amount.

Mr. RYDE: It is not open for me to contend that the rate is an excessive rate.

Mr. MARSHAM: That point is not before me.

Mr. RYDE: I must prove to you that the rate is invalid; and that it is based on a list which is also invalid. The list is made under the Valuation (Metropolis) Act, 1869.

Mr. MARSHAM: Is this a matter of appeal?

Mr. RYDE: There is no appeal.

Mr. MARSHAM: Will you give me the authority for that?

Mr. RYDE: It is *The Fulham Assessment Committee v. Wells*. The case all turns on the Act of Parliament. I do not want to go through the whole of the Act; but perhaps you will allow me to state shortly the effect of it. The Act provides for making a list in the first year after it was passed; and then, at the quinquennial periods, it is to be revised. Every five years a new list is to be made in the same manner as the first one—that is to say, directions for a sample list are given, and then the other lists are to be made in the same fashion. If you turn to section 43, you will see it provides that "the valuation list as approved by the Assessment Committee, if altered on any appeal under this Act to any Sessions or a Superior Court, as so altered, shall come into force at the beginning of the year (commencing on the 6th of April) succeeding that in which it is made, and shall last for five years, subject to any alterations that may be made by any supplemental or provisional list as hereinafter mentioned." The quinquennial list is made in 1870, 1875, 1880, 1885, and 1890; and it comes into force on April 6, 1871, 1876, 1881, 1886, and 1891. The present quinquennial list, which was made in 1885, consequently came into force on April 6, 1886. By section 46, "every valuation list shall be revised in manner directed by this Act; and such revision in every period of five years (the first of such periods beginning with the 6th of April, 1871) shall be conducted as follows:—In each of the first four years of such period, a supplemental list shall, if necessary, be made out in the same form as the valuation list, and shall show all the alterations which have taken place during the preceding twelve months in any of the matters stated in the valuation list, but shall contain only the hereditaments affected by such alterations." If there is no alteration, a certificate to that effect is to be made. This rate is not made on the quinquennial list. The distinction to be noticed is between the supplemental list, directed by section 46, sub-section 1, and the provisional list which is made under the next section. Section 46, sub-section 3, provides: "The same regulations shall be observed, and the same proceedings shall be had in the case of a supplemental list and a new valuation list as are directed by this Act, and the Acts incorporated herewith, in the case of the valuation list made in the first year after the passing of this Act. A supplemental list and a new valuation list shall come into force at the beginning of the year succeeding that in which they are respectively made, in the same manner and subject to the same conditions as the valuation list made in the first year after the passing of this Act. In each of the last four years of such period, the valuation list, which was in force on the day before the commencement of each such year, together with, and as altered by, the supplemental list, if any, which comes into force at the commencement of such year, shall be the valuation list which is in force during the year. A new valuation list, when it comes into force, shall supersede the valuation list which was in force during the fifth year of such period." The effect of this section is to make the quinquennial list, as it is made from year to year, combine and be read together as the valuation list in force in respect of any hereditament. The supplemental list is only to be made in each of the four years of the quinquennial period. Section 47 applies to a different state of things; for it deals with the case where property is coming into existence during the currency of any valid list already in force, and it is merely provisional till the next supplemental list is made. That section is in these terms: "If in the course of any year the value of any hereditament is increased by the addition thereto, or erection thereon of any building, or is from any cause increased or reduced in value, the following provisions shall have effect." It is obvious the whole of these provisions only come into effect when the conditions are complied with. The conditional list can only be made under those circumstances. I may say that the term "year" is defined as being the period from April 6 to the following April 5. It is not a year according to the almanac.

Mr. MARSHAM: I suppose, Mr. Smith, you would have had someone here to represent the parish, if you had known Mr. Ryde was coming?

Mr. SMITH: I knew he was coming; and I spoke to the Vestry Clerk about it, but he thought there was no occasion to have anyone here.

Mr. RYDE: I am not trying to take any technical objection. I say that what they have done is to rate the property twice over in effect, by making this additional list. That is the real fact of the case.

Mr. MARSHAM: You say that the value was not increased?

Mr. RYDE: Yes. I say they could not make the list; but, having made it, they have put the hereditaments at too high a value, though the last point I cannot contend before you here.

Mr. MARSHAM: What you say is that you should not be rated at all?

Mr. RYDE: I say they have rated a person who, we will say, is in occupation of ten houses, but they have rated him for 20. This is the question for you to decide. As the Court of Appeal has held that there is no appeal against the provisional list, I must come before you. Sub-section 1 of section 47 provides: "The overseers of the parish in which such hereditament is situate may, and on the written requisition of the Assessment Committee, or of any ratepayer of the union, or of the surveyor of taxes for the district, shall send to the Assessment Committee a provisional list, containing the gross and rateable value as so increased or reduced of such hereditament." Sub-section 2, I need not trouble you with, because it relates to a state of things which has not occurred. Sub-section 3 is that the clerk of the Assessment Committee is to serve the list on the surveyor of taxes; and sub-section 4 provides: "An objection may be made to any such provisional list by the said occupier, and by the surveyor of taxes, or by either of them, by notice thereof in writing being served on the clerk of the Assessment Committee, on the overseers, on the surveyor of taxes, and on the occupier, or on such of them as the case may require." That objection was in fact waived. Sub-section 5 is that a meeting is to be summoned to hear objections; and sub-section 6: "The Committee shall hear and determine on the objection in the same manner as if it were an objection to a valuation list, and may make such order as they think just." Sub-section 7 applies to the case of no objection being made, which is not this case; and sub-section 8: "A provisional list, signed as aforesaid, shall have operation from the date of the service by the clerk of the Assessment Committee of a copy of the list and notice on the occupier, and shall continue in force until the first list (supplemental or other) which is subsequently made comes into force." Those are really all the provisions of the statute which I have read; and I will now call attention to a case which has interpreted what is the meaning of a list, and a provisional list. That is the case of the *Queen v. The Vestry of Poplar*, which is commonly called the East and West India Dock case, reported in the 13th Q. B. Div., p. 364. If I may state shortly the facts of the case, it will save a great deal of reading. The Dock Company were rated in respect of the docks. They alleged about the third year of the quinquennial period that the amount of shipping coming into the docks had enormously decreased; and they produced evidence of diminution of tonnage coming into the docks for seven years. They said: "This is an alteration in value, within the meaning of section 46, which will cause you to make a new supplemental list." The parish refused to put them into a supplemental list; and they went to the Assessment Sessions, and, upon a case stated, to the Queen's Bench and to the Court of Appeal. The point at issue was this—First, whether the diminution in tonnage of ships coming in, without any structural alteration of the docks, was such an alteration as to necessitate a supplemental list. This point is not before you to-day. The further question was the one which you have to look at—whether, having proved an alteration in value, they were then at large, and to make a new valuation *de novo* of the whole hereditament, or whether they were only to make a new valuation in respect of the alteration. Now, the Court of Appeal held that, having got an alteration, they were not at liberty then to go into the whole property. They wanted to go into the new valuation of the whole, because they could show a large diminution—the Dock Company were bound by the list which they had not appealed against; and it was only open to them to show what was the alteration during the last twelve months.

Mr. MARSHAM: I see that Lord Justice Fry dissented.

Mr. RYDE: Yes; but he was over-ruled by the other two Judges. The Divisional Court went astray on the points altogether.

Mr. MARSHAM: There were two Judges in the Divisional Court.

Mr. RYDE: Yes; both the Judges in the Queen's Bench Divisional Court, however, were over-ruled in the Court of Appeal on one point; and Lord Justice Fry thought that they ought to have been over-ruled on both. The judgment of the two Judges of the Divisional Court, so far as it dealt with the point, would go to show that the alterations are the true value of the hereditament; and they were confirmed by the Court of Appeal. The headnote does not really represent the real facts of the case; and they had altered it by adding at the end these words: "Decision of the Queen's Bench reversed on one point; Lord Justice Fry dissenting, and thinking it should be totally reversed." I may say in this case the alteration alleged is a structural alteration, so that question does not arise. The question is, What is the true basis on which the list should be made, and what hereditaments it should include? The Master of the Rolls says: "It has been argued that if an alteration during the year has been proved, which is, as it is said, a condition precedent to having a supplemental list, then the moment that condition precedent has been fulfilled, the whole enquiry as to what is the rateable value of the hereditaments is to be begun *de novo*, as if they had never been valued at all before, and there had never been any quinquennial valuation; and then you are to compare that value, when so ascertained, with the value in the existing list, and if the figures be different from the figure in the existing list, you are to enter that new figure, and the alteration will be an increase or reduction of the rateable value, as the case may be. If this be true, the Solicitor-General pointed out very considerable difficulties, which, as it seemed to me, would arise, since it would then be in the power of anyone to force an appeal against the existing list (whether that would be the quinquennial list, or a previous supplemental list) after the time had elapsed for appealing, because, by making some alteration in his hereditament, or by reason of some alteration in it occurring, he could then re-open the whole matter. So that, although his hereditament had been increased in value by what had so occurred in the year, yet, by reason of the former valuation having been erroneous, the rateable value in the supplemental list might be less than it was in the former list. I cannot think that the Act of Parliament ought to be construed so as to produce such a result. The meaning of the Act is, I think, that the existing valuation, unappealed against, should be taken to be correct, and that what you have to do is, treating the existing list as correct, to see whether what has occurred since has altered that which was the rateable value before. If this be true, it seems to me that the gross rateable value in the supplemental list is also to be ascertained by assuming that the value in the list then in force is correct at the commencement of the year, and by adding to, or taking from such value the addition or diminution, as the case may be, arising from the alteration during the year. When the alteration has been thus ascertained, the value, as altered, is to be entered in the supplemental list." Lord Justice Bowen deals with the same point. He says: "The second matter to be considered is, what is the exact correction which the Act requires to be made if some alteration is shown to exist. Is the whole matter open and the quinquennial list to be set aside, or is only such correction to be made in the figure in the existing list as represents the alteration which is shown to have taken place in the rateable value during the twelve months? The Solicitor-General has truly pointed out that the quinquennial list is a substantial part and basis of the Act. The object is that, on the one hand, you shall not drift on year by year on the old valuation; and yet on the other hand you shall not have an inquiry every year into the value of the premises. The value is to be fixed every five years; but machinery is provided for re-adjusting it when necessary, but only upon certain conditions, and within certain limits. The quinquennial list was to be a reality; and it was to last for five years. The preamble of the Act is not unimportant as showing its object. It states that it is expedient to provide for a common basis of value for the purposes of Government and local taxation, and to promote uniformity in the assessment of rateable property in the Metropolis. The first section dealing with the quinquennial list which I need allude to is 43; and this provides that the valuation list, as approved by the Assessment Committee, is to last for five years, subject to any alteration that may be made by any supplemental or provisional list as thereinafter mentioned. By section 45, it is conclusive for the purpose of certain rates, including most of the rates in force during the year. Then comes section 46, on the true construction of which our decision must turn. It contains provisions for readjustment by means of a supplemental list. It says: 'In each of the first four years of such period, a supplemental list shall, if necessary, be made out in the same form as the valuation list, and shall show all the alterations which

have taken place during the precedin g twelve months in any of the matters stated in the valuation list, but shall contain only the hereditaments affected by such alterations.' Now what is it you want to get upon the supplemental list? The Act does not say you are to get upon it the real actual rateable value, but that the list shall show the alterations which have taken place during the preceding twelve months. It is true, as Sir Hardinge Giffard has pointed out, that what is in the supplemental list is not a notice that there has been an alteration; but a figure which represents the alteration. This figure, however, does not show an alteration, unless it bears some relation to such alteration. To my mind, the words of the sections mean this (though I do not say so confidently; for I think they are very obscure)—That the supplemental list must show the figure to which the rateable value should be altered, so as to show the alteration that has occurred during the preceding twelve months. Therefore, it must be assumed that the existing list was correct at the commencement of the twelve months; and what has to be done is to make such alteration as will show the alteration in the rateable value during this limited period. If this be not the true construction of the statute, any ratepayer could always practically appeal, after the time for appealing had expired, by making some alteration of the premises; and so challenge discussion before a different tribunal of the value at which the original tribunal arrived." Lord Justice Fry on this point was over-ruled by the other two Judges; so that it is no use reading his judgment. Now, looking at the section again for a moment, What do we find is clear? Section 46 says: "Make your supplemental list once every year where necessary, and the list will show the alterations during the twelve months."

Mr. Marsham: What do you say they have done in this case?

Mr. Ryde: The figures are so absurdly incongruous that the only thing they can have done is to take the whole property, and have re-valued it *de novo*—to have gone back two or three years, and included additions which have been already taken into account, and submitted to by the Gas Company. The rate-book is inconsistent with the list. It puts down the entire gas-works. No further property is alleged; and I rely upon the previous provisional list. I say they are now claiming for rates absolutely inconsistent with the rate-book, and the list which is in force. They have made a subsequent rate on a subsequent list which is invalid.

Mr. Smith: I may say there has been a further increase of £4000 from Nov. 22, which has not yet reached them.

Mr. Ryde: There is no dispute as to that. It is merely a question whether they have power to alter the Act of Parliament. I will now proceed to give you the dates. On Sept. 29, 1887, a provisional list was made, in which this property was inserted at £6000 gross and £5000 rateable; the property being described as "jetty, land, and retort-houses." On June 5, 1888, the supplemental list was made, which adopts the figures of the provisional list—viz., £6000 gross; £5000 rateable. On June 19, 1888, a further provisional list is made, which shows £10,800 gross and £9000 rateable; and since then there has been a further increase of £4000 odd.

Mr. Marsham: That I need not deal with.

Mr. Ryde: No; I purposely omitted that, as I thought it would only add unnecessary figures.

Mr. Smith: I merely mentioned it, to show that they are going on improving the works.

Mr. Ryde: I admit that they are increasing the rates.

Mr. Marsham: If the Company do something, the rates can be altered.

Mr. Ryde: The provisional list of September, which showed a rateable value of £5000, will remain in force during the currency of that year.

Mr. Marsham: Is the rate half-yearly?

Mr. Smith: Yes; payable by quarterly instalments.

Mr. Marsham: Do you say there has been no addition?

Mr. Ryde: I admit there was some addition to the original £5000; and I cannot contend before you that the rating is excessive. I really want to know what list they do rely upon. It is perfectly consistent with their list that they should come on Monday, and take out a fresh summons for the original £5000, and for the £9000 in addition, and also for the £1300 when the new list comes in.

Mr. Marsham: The claim is made on the £9000?

Mr. Smith: Yes.

Mr. Ryde: In order to get in a new valuation list at all, they must prove some sort of alteration in the value of the hereditaments, because the words of section 47, sub-section 8, are: "A provisional list, signed as aforesaid, shall have operation from the date of the service by the clerk of the Assessment Committee of a copy of the list and notice on the occupier, and shall continue in force until the first list (supplemental or other) which is subsequently made comes into force." The effect of this is that, until you have another list, the original list, made on Sept. 29, is what we are to be rated on. We cannot be rated at any more until you can show you have another good list made. Applying the principle of the East and West India Dock case to this, I say the supplemental list must take—be it in favour or against the ratepayers—the valuation at the beginning of the year on April 6 as the list. The Dock Company could not go behind it, nor could the parish.

Mr. Marsham: You say the state of facts on April 6 is binding?

Mr. Ryde: Yes; only they can show that a supplemental list can be validly made.

Mr. Smith: That is providing there is no alteration.

Mr. Marsham: Since the 6th of April?

Mr. Smith: Yes.

Mr. Ryde: They cannot rely on the supplemental list made on June 5, according to sub-section 6 of section 46. I suppose they are going to rely on the last list.

Mr. Smith: I could not tell you.

Mr. Ryde: Sub-section 4 provides that "a supplemental list and a new valuation list shall come into force at the beginning of the year succeeding that in which they are respectively made, in the same manner, and subject to the same conditions as the valuation list made in the first year after the passing of this Act." That would not come into force before next April; therefore it is that they must rely on the provisional list of June 19, 1888, which shows an increase of £4000 rateable value. If the person were here who made the valuation, I think he would admit he has gone straight in the face of the decision of the Court of Appeal, and re-valued the whole property; and by adoptiug a wrong basis of valuation, he has produced this enormous rating amount for the whole property. We say we are entitled to dispute what are the proper subjects of the valuation; and no man in the world can have produced such a valuation list without going into wrong subjects of valuation.

Mr. Marsham: I understand you to say that all he had any right to do was to consider any alterations or additions made to the works since the last list?

Mr. Ryde: Since the last list was in force. I have conclusive evidence to show he must have transgressed that rule, because he has actually produced an annual rateable value more than double the fee-simple sum expended—the capital money. It is quite obvious he must have gone beyond the proper principle of valuation, and applied his mind to different hereditaments.

Mr. Marsham: You say that he has assessed the whole works of the Company?

Mr. Ryde: He must have done so.

Mr. Smith: Do you contend there has been no addition since the 6th of April?

Mr. Ryde: I am prepared to admit a slight alteration.

Mr. Marsham: Suppose you admit that certain alterations have taken place during the time, he is entitled to take that into consideration?

Mr. Ryde: Yes.

Mr. Marsham: Does not that oust my jurisdiction?

Mr. Smith: Yes.

Mr. Ryde: The old cases say that a question of amendment of valuation is not to be gone into before the Police Magistrate. The question of value is a matter of appeal; and with the decision of the Court of Appeal before us, there is no appeal against the valuation list. The only thing to prevent injustice being done is when they make out next June their supplemental list; and then take in this provisional list made last June. Then, after they have made that list, and it comes into force on the 6th of April, 1890, and if that list shows a less value than appeared in the provisional list, we cannot obtain a reduction when the rates are made. But it may very well be that between now and next June the property will be increased in value. They are going on increasing the value of the property; and to bring themselves within section 47, they must show that there has been an alteration. In this case, the physical alterations in the property are so utterly out of proportion to the sum appearing in the list that I think I have done enough to put the burden on them of showing that they have rightly valued the property.

Mr. Marsham: Do you say I can go into the question of whether he has not gone on the right principle, but whether he has over-estimated it?

Mr. Ryde: No; if he will come and say: "I have only put a valuation on the additions," however ridiculous the valuation may be, I am bound. It is obvious he cannot do that; for no one can put twice the annual value on the capital sum.

Mr. Smith: It appears in this case he has put an increased value on the additions.

Mr. Ryde: He has put £4000 as the annual value on a capital expenditure of £2000. The increase of annual value is double the expenditure. We know that he takes 5 per cent. on the expenditure as representing the rateable value—that is to say the expenditure is twenty times the rateable value; so that the increase of £4000 should represent an expenditure of £80,000. But I have witnesses here to prove that £2000 is the very outside sum. Therefore, the person who made the list must have gone on an entirely wrong basis, and has utterly failed to appreciate his duty under the Act of Parliament.

Mr. Marsham: I cannot give a decision to-day; and perhaps I had better adjourn the case, so as to allow the Vestry an opportunity of being heard.

Mr. Ryde: Do you wish to adjourn it before I formally prove the expenditure? I have a witness here to prove what the outside expenditure has been on the works.

Mr. Marsham: Would it not be better to hear from them the principle on which they have gone?

Mr. Smith: I may tell you, Sir, the Vestry Clerk said it was no use to attend on behalf of the parish, as the question could not be settled here.

Mr. Marsham: He may have been unaware of the Fulham case. He may say perhaps that I am precluded.

Mr. Ryde: If he says, I see a cottage has been built, and I value it at £200 a year (although it may only be worth a few shillings), I cannot dispute that; but when I show you he has valued 20 cottages, when there has been only one built, it is for the Vestry to say what has been valued. Then there is another objection. The entry in the list which has been shown me is verbatim a copy of the entry in the original list. They do not purport to have made an alteration; and looking at the two lists, it is consistent that they may go on the original list.

Mr. Marsham: There is no appeal given by the Act.

Mr. Ryde: The one section covers the very thing.

Mr. Marsham: Where there is no power given by the Act, there is no power to appeal. I think I had better adjourn the case; and perhaps Mr. Smith will communicate with Mr. Bristow, and call his attention to the Fulham case.

Mr. Ryde: The parish authorities are at any rate conversant with the principle of the case, though they may not be conversant with the decision; for they have told my clients in correspondence that there is no appeal from the list. Although the decision was only given last June, it has always been accepted as law; and no appeal has been brought against the provisional list. The parish authorities know this point very much better than I do; and until that case was decided, no parish ever suggested that there was a right of appeal. It has always been accepted as law. Perhaps you will permit me to make this suggestion—that the case should be adjourned until after the matter has been before the Assessment Sessions.

Mr. Marsham: That will take some time.

Mr. Ryde: I think it will be heard in February.

Mr. Marsham: They may want a case stated.

Mr. Ryde: If the case is so important as to require that, it is rather a reason for adjourning it.

Mr. Marsham: Are you going to enter an appeal as to this?

Mr. Ryde: No; because if we appeal against the supplemental list, which will take in part of this, then we shall be entitled to be repaid. It is rather hard upon us to be forced to pay under a strong suspicion of illegality.

Mr. Marsham: Would you be prepared to pay the amount due under the old £5000 list?

Mr. Ryde: Yes.

Mr. Smith: The parish would not accept it.

Mr. Marsham: Will they accept it on account?

Mr. Smith: They will not accept a part.

Mr. Ryde: We offered to pay on the £5000 list, without prejudice to any question on either side; the payment to be on account of whatever may be found due.

Mr. Smith: The parish would not accept it at all.

The further hearing of the case was then adjourned.

The Price of Gas at Wolverhampton.—It is reported that the Directors of the Wolverhampton Gas Company intend, if the receipts for the past half year turn out to be as satisfactory as is expected, to announce at the approaching half-yearly meeting, a reduction of 2d. per 1000 cubic feet in the price of gas.

The South Kent Water Company's Scheme.—The Provisional Order which the South Kent Water Company are applying for to Parliament, so as to erect and maintain a pumping station at Brandbridges, is likely to be opposed by the Parliamentary Committee of the Kent General Sessions, as it is thought the works may affect the flow of the river at flood times, to the detriment of the bridges and roads.

Miscellaneous News.

METROPOLIS GAS SUPPLY.

The Chief Gas Examiner for the Metropolis (Dr. Williamson, F.R.S.) has presented his report on the quality of the gas supplied by The Gaslight and Coke, the Commercial, and the South Metropolitan Companies, during the quarter ending Dec. 31. The following is an abstract:—

I. *With respect to Illuminating Power.*—The average illuminating power, in standard sperm candles, at each of the testing stations, was as follows:—

The Gaslight and Coke Company—	
Jewry Street, E.C.	15·9
King Street, E.C.	16·8
Dorset Buildings, E.C.	16·6
Ladbroke Grove, W.	16·5
Devon's Road, E.	16·6
Carlyle Square, Chelsea	16·3
Camden Street, N.W.	16·5
Graham Road, E.	16·4
Kingsland Road, E.	16·8
Spring Gardens, Charing Cross, S.W.	16·5
Grove Gardens, Regent's Park, N.W.	16·3
Lambeth Road, S.E.	16·5
Hornsey Road, N.	16·4
Millbank Street, S.W. (cannel gas)	20·6
Commercial Gas Company—	
Wellclose Square, E.	16·4
Parnell Road, E.	16·5
South Metropolitan Gas Company—	
Hill Street, S.E.	16·5
Foster Place, S.W.	16·2
Stoney Lane	16·5
Lewisham Road, S.E.	16·3
Blackfriars Road	16·1
Burrage Road, Plumstead, S.E.	16·2

It will be seen from these results that the average illuminating power at all the testing stations (with the exception of Jewry Street) has been higher than the parliamentary standard. At the King Street, Dorset Buildings, Ladbroke Grove, Kingsland Road, and Hill Street stations, the minimum lighting power was higher than the standard; while at Millbank Street, Devon's Road, Graham Road, Lambeth Road, Foster Place, Stoney Lane, and Lewisham Road, it was equal to the requirements. Several deficiencies in illuminating power were reported from the Jewry Street and Burrage Road stations during the quarter.

II. *As regards Purity.*—Sulphuretted hydrogen has not been present in the gas at any of the stations. The average amount of sulphur in other forms was considerably less than the amount allowed (22 grains per 100 cubic feet) at all the testing stations. On no occasion was the limit exceeded during the quarter. With the exception of the City of London testing stations, ammonia has been generally present in the gas more or less frequently during the quarter, but only in slight quantities. The limit allowed was not exceeded on any occasion.

THE GAS COAL CONTRACTS OF THE LEEDS CORPORATION.

Replying to one portion of Mr. Ellis Lever's letter and telegram to the Town Clerk of Leeds (*ante*, pp. 73-4), Mr. John Hunt, a member of the Leeds Gas Committee, whose name was mentioned by Mr. Lever, writes: "In reply to Mr. Ellis Lever's telegram to the effect that 'Alderman Lowley is mistaken in saying that Mr. Ellis Lever made no complaint when the alleged analysis was made,' I beg to say that Mr. Lever did ask for the marks on the bags alluded to, and I found the marks for him which I had made at the time the bags were in the railway yard. Mr. Lever made no further observation, and did not suggest, as he now does, that the bags had been tampered with. If he had done so, another supply could easily have been obtained, as the trucks were still at the railway siding just as he had left them. He knows as well as I do that there had been no tampering with the bags. When I entered into this inquiry, at the request of the Mayor (Alderman Scarr) and Mr. P. Gilston (Chairman of the Gas Committee), I determined that their instructions should be carried out—viz., that Mr. Lever should be allowed to examine and pick out anything he wished, from any waggon or bulk, without interference from any of the officials, and to have such assistance in labourers as he required. He examined part of the contents of one waggon, out of which he picked 1 cwt. of what he called 'hub' and slack. He then went to the Meadow Lane works, and examined the test sample, and found hub in about the same quantity. He then left Leeds and telegraphed to the Mayor to set aside three waggons for examination—one from each contractor whom he named. These were examined on the following Wednesday and Thursday, with the result stated in his report; but the chemical analysis of his own Analyst (Mr. Paterson) and also of Mr. Fairley, our Borough Analyst, proved that what he called 'hub' was equal to the best selected cannel. These are the results after a fair, honest inquiry, and after examination and tests made. My opinion is that Mr. Ellis Lever has failed in all the charges he has made against the contractors named by him. With reference to the charge that Mr. Gilston did not answer questions put to him, I think it is unfair for one contractor to be allowed to see the prices, &c., of his competitors. This has never been permitted by the Leeds Gas Committee, and I hope they will still continue to do their business with colliery owners direct and with as few middlemen as possible."

On Monday last week, the Gas Tests Sub-Committee of the Gas Committee of the Leeds Corporation met to consider matters arising out of the recent charges made by Mr. Lever; and some discussion took place upon the allegation of Mr. Willey that the Corporation are losing large sums of money through their gas coal contracts. The *Leeds Mercury* understands that Mr. Willey quoted statistics with a view of showing that his allegations were in the main correct. His statements were controverted by other members of the Committee, and figures were given to prove that during the past few years there had been a profit on the contracts. It was decided to report upon the subject to the General Gas Committee.

Mr. Lever's reply to the above letter (addressed to the local newspapers) is in these words:—

Colwyn Bay, Jan. 7, 1889.

SIR,—If in the course of the correspondence between myself and the Corporation of Leeds, I have thought it right to refer in appreciative terms to the attitude of Councillor Hunt and to the assistance which he undoubtedly rendered in the selection of the samples, Mr. Hunt has only himself to thank. I will not impute motives, as does Mr. Hunt in his letter, nor will I endeavour to cast doubt upon his good faith; but at the same time there is much that requires explanation in the remarkable change of front which he has exhibited.

My first introduction to Councillor Hunt was on Saturday, the 20th of October last, when, after asking to see truck loads of cannel from certain collieries, I accompanied the Mayor (Alderman Scarr), Mr. Gilston, Sir George Morrison, and Mr. James Lupton to the York Street Gas-Works. I was told that Mr. Hunt, who was with Mr. Townsley at the works, was the Chairman of the York Street Works Sub-Committee, and that Mr. Townsley was the newly-appointed Manager of the works. I was disappointed to find that there was no railway siding into the works, and consequently no trucks of cannel there. But Mr. Gilston said that the material was all brought there in carts, and I could see it. A large heap of cannel was pointed out to me as cannel from the Soothill Wood Colliery; and on my expressing a doubt as to the accuracy of this statement, Mr. Hunt, Mr. Gilston, Mr. Lupton, and Mr. Townsley assured me that it was every bit Soothill Wood cannel. I know the Yorkshire cannels so well that I was still incredulous; and on my calling one or two retort-men to say what the cannel really was, they promptly replied that while a portion of the heap came from the Soothill Wood Colliery, that which I had particularly pointed out—being part of the same heap—was Tingley cannel from another colliery altogether. This occurred in the presence of the Mayor and the Town Clerk; and I am sure they will confirm my statement. Mr. Gilston then left the yard; and I declined to make any examination of a mixed heap of cannel. That is why I asked that three waggons from three separate collieries in the same neighbourhood should be set aside for examination and comparison during the following week. I may say that for a great number of years I have bought large quantities of cannel from the collieries in Yorkshire; and the colliery proprietors there know that my experience would enable me at once to detect any deviation from the high standard of quality which I bargain for. When the hub and cannel were being separated in the railway yard on the 24th of October, Mr. Hunt was not only present during the whole time, but he took a personal and prominent part in the actual sorting of the materials; and a considerable portion of the samples afterwards deposited at the Meadow Lane Gas-Works was picked out and added to the various heaps by his own hand.

Mr. Hunt certainly agreed that the material described by me as slack was slack, and that the hub was hub; and he was assiduous in detaching pieces of the hub from the pure cannel by means of a hammer. He stated in strong terms his opinion that the trucks examined contained the worst sample of cannel he had ever seen; and he even mounted on to the top of several waggons of Howley Park cannel beside the one we were inspecting, and called my attention to the fact that—so far as could be seen from a surface examination—their contents were no better than those of the truck set aside for the purposes of inspection. From these, he threw out on the ground many pieces of hub before I climbed upon the trucks at all. This he did in the presence of the Mayor, the Town Clerk, Mr. Lupton, and Mr. Townsley.

It cannot be too strongly or clearly stated that—irrespective of analysis—the cannel contracts expressly stipulate that the cannel shall be free from bass, shale, pyrites, slack, bind, and hub. The waggon of Howley Park cannel inspected in the railway yard on the 24th of October admittedly contained pyrites, hub, and slack, contrary to the provisions of the contract.

If any further justification of my statement were needed, Mr. Lupton has himself furnished it in a paragraph which he communicated to the *Yorkshire Post*, and which appeared on the 19th of November last, as follows:—

MR. ELLIS LEVER AND THE LEEDS COAL CONTRACTS.—Mr. J. Lupton (Secretary to the Leeds Gas Department) writes to say that in our report of the proceedings of the Leeds Town Council on Wednesday, Alderman Scarr (ex-Mayor) is reported to have stated: "Mr. Lupton (the Secretary) said that if Mr. Ellis Lever had not come to Leeds, they would not have discovered certain deficiencies in the coal of the Howley Park Company;" whereas his (Mr. Lupton's) statement was just the reverse, the fact being that 33 per cent. of inferiority had been discovered in the coals of the Howley Park Company prior to the assistance (?) volunteered by Mr. Ellis Lever.

The insertion of the note of interrogation by Mr. Lupton is consistent with the conduct of that gentleman throughout, and shows the personal and bitter spirit which he has imported into the discussion of a public matter.

By his new departure Mr. Hunt has afforded himself a choice of positions in the matter, of the personal benefit of which no one will seek to deprive him. Either he acted in perfect ignorance of the nature of cannel and hub when he assisted in the selection of the samples, or he acted with full knowledge, and, knowing me to be right, gave me at the time conscientious aid, in which case there must exist some extraordinary reason for the change in his policy; or else, believing me to be wrong, he disingenuously represented himself as being convinced that I was right, with the deliberate object of deceiving me. In any case, I freely withdraw the objectionable compliments I have paid to Mr. Hunt; and I trust that his uneasiness at the thought that I regarded him as being unbiassed, fair, and impartial, may be dissipated.

Whatever Mr. Hunt may say, I can prove that, when the sample bags of material were produced in the sample-room at the Meadow Lane Gas-Works on the 7th of November, I did protest, and I did ask how I was to know that the samples were the same as those selected on the 24th of October. I distinctly assert that I never admitted that the test samples on which the purchases are alleged to have been made contained the same quantity of hub as the samples selected by me. This is directly opposed to Mr. Hunt's statement. The only sample test shown to me had, I found, been lying at the Meadow Lane Gas-Works since 1886.

The insinuation conveyed in Mr. Hunt's letter, to the effect that Mr. Gilston did not answer my questions because it would be unfair to convey to me the prices of my competitors in trade, is altogether false. I never sought to know the prices; and I repeat that when I asked Mr. Gilston for certain information which would have enabled me to place a very different complexion on the whole matter, I expressly stated that my questions had no reference to prices. The ex-Mayor and the Town Clerk can confirm this. The virtuous indignation expressed by Mr. Hunt at the idea of the prices paid by the Gas Committee being given to one who was a competitor when the tenders were sent in, loses much of its force when it is remembered that several colliery proprietors sit on the Gas Committee, and have an opportunity of seeing the prices quoted by their competitors in trade. The limitation of competition thus effected is not only unfair to contractors, but unjust and prejudicial to the gas consumers; and I could show that it has caused the loss of many thousands of pounds annually for a long period. When a gas-works like that at Leeds shows a loss on the year's working of £17,000, there must be maladministration somewhere.

As I have already said, I will not follow Mr. Hunt upon the doubtful lines of imputing motives; but it does appear to me that, in his anxiety to cast a stone—or something softer and more apt to stick—at "middlemen" he has succeeded in making tolerably clear the feelings, if not of himself, at all events of those who are the real authors of his letter. "I hope," he says, "that they (the Committee) will continue to do their business with colliery owners direct." Reading between the lines, it is not difficult to imagine that this aspiration would be a more correct expression of the sentiment which it is intended to represent, if it were less

general in its terms, and indicated with precision, the particular colliery owners to whom the orders should be given.

The personal attacks to which I have been subjected in the course of this affair must have made it clear to the impartial mind that a determined effort has been made not only to rebut, at any cost, my so-called "charges," but also to prejudice me as far as possible with a view to such further disclosures as I may have to make. I am not, however, in the habit of allowing such attacks to shake my purpose. If I had been, the Salford gas scandal would never have seen the light; and in spite of the desperate attempt which is now being made in Leeds to put a good face on the matter, in spite of congratulations by the Mayor, jubilation in the Gas Committee, and indifference in the Council, I shall yet be able to show that my demand for a thorough investigation into the Leeds gas undertaking is a just and reasonable one.—Yours faithfully,

ELLIS LEVER.

BURY CORPORATION GAS SUPPLY.

THE ILLUMINATING POWER OF THE GAS.—THE PRICE OF COKE.

At the Meeting of the Bury Town Council on Thursday, the 10th inst.—the MAYOR (Alderman Smethurst) presiding,

Mr. PEEL, referring to the quality of the gas, said he had heard great complaints from workshops and mills as to its low illuminating power. He understood that now they had the most approved apparatus, the Committee were endeavouring to make gas from inferior coal. One really would think that now first-class gas would be supplied.

Alderman HORRIDGE said he did not know that he could give much information, in the absence of the Chairman of the Committee; but gas which was of 18-candle power was considered to be very good. The Gas Examiner did not belong to the Corporation, and if they did not consider him competent, they should get someone else. The tester contended that the gas, on an average, was of 18-candle power. Some people said that the Examiner was more connected with the Gas Committee than with any other Committee; but he ought not to be. They ought to have some independent tests made to see whether or not he was right. He (Alderman Horridge) maintained that the gas was of 18-candle power.

Mr. BENTLEY thought the observations of Alderman Horridge would be an encouragement to those who considered some change should be made in the position of the official tester of the gas supplied by the Committee. At present the Examiner was appointed by the Gas Committee; and he made his report to that Committee. The tester was appointed in the interests of gas consumers; he should be paid apart from the Gas Committee; and his reports should he made to the Mayor, and not to the Committee at all. It was true that, according to the reports sent to the papers, they were supplied with gas of good illuminating power; but relying on his own experience, he could say that the gas was not always of the quality which the report gave it credit for being. After what Alderman Horridge had said on behalf of the Committee, he would ask that there should be some alteration in the position of the Examiner—that he should have instructions to send his reports to the Mayor, and that he should keep aloof from the Gas Committee in every possible way.

Mr. HARDMAN suggested that the Committee should reduce the price of coke.

Mr. MELLOR said they had lowered the price of coke twice. It was reduced in the summer, when there was a large stock, on purpose to get rid of it; and that lessened it to a considerable extent. Coke was, however, going out of the town at the present rates; and if they dropped the price still lower, they would increase their sales outside.

ROCHDALE CORPORATION GAS SUPPLY.

COMPLAINTS AS TO THE ILLUMINATING POWER OF THE GAS.

At the Monthly Meeting of the Rochdale Corporation last Thursday week—the MAYOR (Mr. J. E. Petrie) presiding—a brief discussion in regard to the illuminating power of the gas arose on the presentation for confirmation of the Gas Committee's minutes.

Alderman SCHOFIELD called attention to the fact that no statement was made in the minutes as to the illuminating power of the gas. He presumed it was at the stereotyped rate of 18 candles. He had no doubt that the test yielded such a result; but at the same time he was quite satisfied the gas was not of the illuminating power which those figures would lead one to expect.

Mr. DIGGLE remarked that he had heard bitter complaints of the quality of the gas supplied during the holidays.

Mr. SHARP had also heard complaints as to the inefficiency of the gas in this respect.

Alderman MILNE, Chairman of the Committee, said he himself had received, during the last week or two, complaints as to the falling off in the illuminating power of the gas. He could not understand it. They took the record from the Borough Analyst; and he really could not tell them why the quality of the gas at the works should be different to what it was anywhere else. He did not believe that the Borough Analyst would record anything he did not think correct. He would promise the Council that the matter should be inquired into at the next meeting of the Committee.

Alderman SIMPSON thought the illuminating power of the gas was not so much as it was represented to be. He, of course, did not wish it to be thought that there was any collusion between the Manager of the gas-works and the Borough Analyst, or any wrong action on the part of either; but the test in the report—18·09 candles—was certainly misleading.

Alderman TAYLOR inquired whether the condition of the atmosphere had been considered. A foggy day would make all the difference to the illuminating power of the gas.

Alderman SCHOFIELD pointed to the fact that the day was a very foggy one; and the gas was giving an excellent light in the room.

Alderman BARON reminded Alderman Schofield that the character of the burners used would make all the difference. He believed the Borough Analyst was thoroughly honest in the statement he had made.

Mr. HANDLEY, while not disputing the honesty of the Analyst, still supported the statement made by Alderman Schofield. There was something wrong at the gas-works, whatever might be said in extenuation of the gas being bad.

Alderman MILNE said he would admit there had been some difference in the light; but he did not think for a moment there was anything wrong at the gas-works. He believed that everything at the gas-works in regard to this matter was honestly and fairly carried out.

The minutes were adopted.

THE SUPPLY OF GAS TO ABRAM.—At the meeting last Thursday night of the Hindley Local Board, an application from the Local Board of Abram as to the terms on which gas could be supplied to their district was considered. The mains were estimated to cost £1300, and the income from lamps to be £102. It was decided to reply that the Board were prepared to supply gas on the same terms as to Hindley consumers.

THE DUBLIN CORPORATION AND THE ALLIANCE AND DUBLIN CONSUMERS' GAS COMPANY.

PROPOSED REFERENCE OF THE DISPUTE TO ARBITRATION.

At the Meeting of the Dublin City Council yesterday week—the LORD MAYOR (the Right Hon. Thomas Sexton, M.P.) presiding—the letters which have been addressed to the Corporation by the Secretary of the Gas Company (Mr. W. F. Cotton), which, it will be recollected, contained a request that legal proceedings might be taken against the Company, in order to test the correctness of the charges preferred against them, were under consideration.

A report was first read from the Gas Committee, in which, referring to the Gas Company's letters, they said: "We beg the Council to observe that the proposal of the Company is that out of the several matters in dispute between the Company and the Corporation one is to be taken, detached from all the rest, and submitted by an entirely novel prosecution to a tribunal wholly unpractised in the trial of cases of this technical character; and, further, that this one detached matter is to be so submitted for the purpose, not of obtaining an adequate settlement, but merely enforcing immaterial penalties. We have already adopted such measures as we deemed advisable, in order to do what it is said the proceedings in the Police Courts might accomplish—viz., to test the accuracy of the reports made by our Inspector, in the discharge of his duty, as to the illuminating power of the gas supplied by the Company. We are in a position to tender evidence on the subject when an occasion, which we consider suitable, presents itself; but with regard to the suggestion that a complicated technical question determinable wholly upon expert evidence should be dealt with in a Police Court we cannot recommend the Council to allow itself to be drawn into a course so ill-fitted both to the nature and the extent of the case, and so little likely to set at rest even one of the several controverted questions. The Company themselves have suggested . . . a very much less inappropriate mode of procedure than that of resort to a Police Court. They say in their letter of the 26th of November last:—'If the Committee at any time appoint a competent and impartial person to enter upon and investigate the subjects under discussion, the Board will give your Committee and the person so appointed every possible facility and assistance in settling the question at issue.' Again, the Company say in their letter of the 27th of November: 'If your Committee will appoint a competent and impartial person to inquire into the subjects referred to in your letter, the Board will give every facility and assistance in their power.' The Company here declare and re-affirm their readiness to submit, not an isolated point, but the questions under discussion and at issue to an authority specially qualified; and to do this in order to obtain a settlement of questions under discussion. We recommend the Council to act upon this suggestion of the Company, by intimating their readiness to name an arbitrator; and requesting the Company to facilitate, and assist a settlement by also naming an arbitrator in order that questions at issue between the Company and the Corporation may be considered and determined according to the provision made by the Gas-Works Clauses Consolidation Act (1847) Amendment Act, 1871, for procuring a settlement of disputes of this particular kind. We have informed the Company by a letter that we offer this recommendation to the Council." The various letters from the Gas Company (portions of which have already appeared in the JOURNAL) were next read; and then a report from the Inspector of Lighting (Mr. T. J. Cotton), in which he said that, while he was fully prepared to substantiate the accuracy of his reports by his own tests, fortified by competent independent testimony, he did not advise the adoption of the course suggested by the Company—*i.e.*, to take legal proceedings. He averred that the whole of the official arrangements for testing gas in the city were unsatisfactory, and suggested that they should be remodelled. The report continues: "The situation of the testing station at Burgh Quay is unsuitable; and the instruments which are required by law to be supplied by the Gas Company are defective, and not in proper working order for determining with accuracy the quality and purity of the gas. The conditions under which I am enabled to make tests in consequence of the unauthorized intrusion of officials and workmen of the Gas Company and even persons unconnected with the Company, renders a delicate operation unnecessarily prolonged and extremely difficult. It is only by means of extra official instruments—the property of the Corporation, and in use at the Corporation Station at Hanover Street—that I can be certain of results. Again, only a portion, and in my judgment a small portion, of the gas supplied (through the different trunk mains to all parts of the city) can be tested at the official station, Burgh Quay. Instead, therefore, of the proceeding suggested by the Secretary of the Gas Company, I would recommend the Committee to have recourse to the arbitration section of the Gas-Works Clauses Amendment Act, 1871, by which this and all the other questions can be finally and satisfactorily determined." A letter was also read from the Law Agent of the Corporation, in which he said: "By the 27th section of the Gas-Works Clauses Act (1847) Amendment Act, 34 and 35 Vict., cap. 41, it is enacted that any difference which may arise between the undertakers [in this instance the Alliance Gas Company] and any local authority [in this instance the Corporation] in relation to the supply or consumption of gas to or by such local authority, shall be from time to time settled by arbitration in manner provided by the Companies Clauses Consolidation Act, 1845, with respect to the settlement of disputes by arbitration. The above Act is incorporated with the Alliance Company's Acts by the third section of their Act of 1874. Notwithstanding the use of the mandatory word "shall" in the section of the Act above quoted, I am not able to say that in no case of dispute can legal proceedings be resorted to, having regard to the 36th section of the same Act, which provides a mode of procedure before police magistrates (justices) for penalties in the event of neglect to supply, or of the gas supplied being under less pressure, of less illuminating power, or of less purity than it ought to be; but I am of opinion that such questions as well as the dispute as to change of position of the testing station, the condition of the apparatus in such station, the condition of such station, the quantity of gas charged for, and the price as affected by a question of an allowance of a discount, are eminently such questions of dispute as should be settled by arbitration."

Alderman DILLON moved—"That the Council cannot adopt the suggestion of the Secretary of the Gas Company, to the effect that the Corporation should sue for penalties for defective lighting, but that the Council approve of the present issue between the Company and the Corporation being referred to arbitration in the manner provided by the Gas-Works Clauses Consolidation Act (1847) Amendment Act, 1871; that the letters of the Secretary of the Gas Company and the letters of the Inspector of Public Lighting be referred to the Special Gas Committee appointed by the Paving and Lighting Committee; that the appointment of the Gas Committee be confirmed by the Council, and that they have full power to deal with all questions relating to public lighting, with power to fix the city seal to any documents requiring to be sealed in connection with the arbitration." The Secretary of the Gas Company, he went on to say, complained that reckless charges were made in the Council against the Company. He should regret to make reckless charges against anybody, or

shelter himself under the privileges of the Council; and therefore, with extreme satisfaction, he took advantage of the suggestion made by officials of the Company to have this whole matter terminated at once and for all, he hoped, by a competent and satisfactory arbitration. Since the appointment of Mr. Cotton as Inspector, the Committee had had numerous reports from him as to the defective condition of the testing-station. They were informed by their officer that an examination of the maps referred to by the Secretary of the Company completely confirmed his report that only a very small portion of the gas supplied to the city was being tested, or had been tested for years past, at the Company's station at Burgh Quay. The idea of the appointment of this station was not that it was to be the Company's station, but the Corporation station, under the sole control of the officers of the Corporation, and not under the control of officials of the Company. They had the report of their Inspector that when he went to test the gas, not only was there an officer of the Gas Company there, but he was followed about from room to room by an official of the Company with a note-book, who took down every word said, everything done, and every motion made by the Corporation official. This was a condition of things which he trusted the arbitrator would not allow to continue. Then they said the gas came to the station through a 6-inch main connected with a large feeding main in Brunswick Street. He was sorry to say an examination of the maps showed the contrary to be the fact; and instead of having the gas supplied to the City tested, they found that they had at most the gas supplied from one main coming in a different direction altogether from that to which the Secretary of the Company referred, and that there were six other mains of equal size to this one main pouring gas incessantly to all parts of the city which had never been tested.

Mr. M'Donnell seconded the resolution.

Mr. Dennehy regretted that the course of referring this question to arbitration had not been adopted at the beginning. The report of the official appointed by the Board of Trade did not agree with that of their own Inspector; and one of the questions that would have to be decided at the arbitration was whether their Inspector knew how to test gas.

Mr. Cummins was perfectly sure that when the proper time came it would be proved clearly that their Inspector was quite competent to test gas.

Mr. Mayne, M.P., remarked that, as a member of the Gas Committee, he felt at one time that there ought to be no difficulty in coming to an amicable arrangement with the Gas Company. He had a lively recollection of how in the past their officer was treated, and of his complaint of how he was abused and insulted. He himself, at Hanover Street, on a former occasion, could get little or no information or civility. Their own officer, then, had come to regard himself as almost an officer of the Company rather than an officer of the Corporation, and would afford practically no facility. Now, for the first time the Corporation had an officer who supplied them with information on which they could thoroughly rely. This information had been tested by capable men; and in every respect the reports of the Gas Inspector had been confirmed. They had been going on for years complaining, objecting, and letter-writing. At last, he believed, they were getting to the end of the long lane; and as a member of the Committee he was glad the opportunity was presented to them.

Sir George Moyers thought the resolution a very complex one. He felt perfectly satisfied that if the eulogium just passed on their Inspector was justified, the Court would believe him, and fine the Company. It looked therefore a little weak on their part not to seize the opportunity of testing this difficulty by summarily proceeding against the Company for supplying an inferior article. Possibly, however, the reports of their Inspector would not be supported. As to arbitration, he much preferred the readiest method. The resolution then went on to ask them to confirm an appointment of a Sub-Committee, by whose action he for one refused to be bound. He failed to see why he should be asked to give his sanction to what the Committee would do. As to the independent Gas Examiner being appointed, he did not quite see how that appointment was made, except that he was told at a meeting of the Paving and Lighting Committee: "Oh, by the Sub-Committee." He would like to know something more about this celebrated Sub-Committee—the time and manner of their appointment, and at least their names; and he would ask them certainly to remember that there was no such haste as would warrant their placing such powers as were asked for in the hands of any Sub-Committee. He would not oppose arbitration; but he would certainly impress on the Council the very peculiar and suggestive way in which the Paving and Lighting Committee was constituted, so as to bring about the condition of things that now existed.

Mr. Gill supported what Sir G. Moyers had said [with regard to the manœuvring in reference to the Sub-Committee in the Paving and Lighting Committee. He was at one of their meetings a week or so ago, and there was a talk about exchange. Alderman Flanagan said he was going to exchange with Mr. Mayne, and, said he: "You may as well put me on the Gas Committee too; it will save a lot of trouble, because when I exchange there, Mr. Mayne will fall into all my plans." That was the little arrangement; whether it was legal was a different thing. All he could say was that owing to the extraordinary way in which the Committee was constituted, if it was constituted at all, and the enormous powers they took, he for one had made up his mind that during the year he would not sign any cheques that might be drawn by the Paving and Lighting Committee.

Mr. Doherty considered that arbitration would be more dignified than Police Court proceedings. He thought, however, they had no right to delegate to any Sub-Committee the powers of the Corporation in the matter of providing new machinery for gas-testing to the extent they had done.

Alderman Perry supported the resolution. It was impossible, he said, that Mr. Tichborne could give a true test, when he had not a second instrument to test his results. They had obtained a new and improved machine; and they found the tests by it did not agree with those of Mr. Tichborne.

Mr. Doran did not believe that the Secretary of the Company ever thought that the Corporation would go to the Police Court in a matter of this sort.

Sir G. Moyers moved as an amendment—"That the Council approves of the question at issue between the Gas Company and the Corporation being referred to arbitration in the manner provided by the Gas-Works Clauses Consolidation Act (1847) Amendment Act, 1871, and that the letters of the Secretary of the Gas Company be referred to No. 1 Committee to have the arbitration carried out."

Mr. Dennehy seconded the amendment.

Mr. Shanks considered that the original resolution was faulty in not conveying any definite instructions to the Committee; and he thought the powers attempted to be conferred on the Sub-Committee were too great.

Mr. Dawson understood that there was a Committee to whom this question was absolutely referred to take all necessary steps in reference to gas. He believed the Paving and Lighting Committee had been so empowered.

The Lord Mayor said Mr. Dawson was right. All the powers of the Paving and Lighting Committee were conferred on the Sub-Committee.

Sir G. Moyers inquired whether that Sub-Committee had been re-appointed.

The Lord Mayor replied in the affirmative.

Mr. Dennehy protested against such power as that demanded being given to any Sub-Committee.

A division then took place on the amendment, when 11 voted in favour of it, and 33 in opposition.

Alderman Meagher suggested that whatever arrangement the Sub-Committee made with the Gas Company, should be subject to the approval of the Council.

The Lord Mayor said that the resolution gave the Committee no power to come to terms. The discussion had made it clear that every member of the Council, without distinction, was in favour of arbitration. What the resolution did was to enable the Council to give validity to certain documents essential to the arbitration by affixing the city seal.

The resolution was then carried.

Mr. Dennehy was understood to say that he would hand in a notice of motion challenging the power of the Corporation to delegate its authority.

PARA GAS COMPANY, LIMITED.

The Ordinary General Meeting of this Company was held last Thursday, at the London Offices, 16, St. Helen's Place—Mr. Robert Morton in the chair.

The Secretary (Mr. T. S. Borradaile) read the notice convening the meeting; and it was agreed to take as read the Directors' report, an abstract of which was given in the Journal last week, p. 77.

The Chairman, in moving the adoption of the report and accounts, said he thought they were upon the whole satisfactory—as satisfactory as the Board were led to believe they would be, though not quite so much so as they could desire. He might mention that this was their annual meeting. The meeting in July last was convened for the special purpose of declaring a dividend; and if the motion to be proposed at the extraordinary meeting that day was carried, the necessity for calling such a meeting would not arise again, unless there was special reason for it. Comparing the results of the year with the one immediately preceding, it would be seen that the cost of repairs was about £2000 less, and that the amount at the credit of profit and loss account was increased by a like sum. Wear and tear for the current year would be higher than last, as most of the retorts were being renewed. The Manager (Mr. J. Gibson Newbigging) reported that all the plant was being kept in good repair; but he had experienced great difficulty in getting rid of coke, and was hampered very much in the works by its accumulation. To help him to remove this, the Directors had given him instructions to revert to the old practice which was in vogue at the commencement of the Company—viz., to carbonize wood instead of coals. Mr. Newbigging was asked some time ago to make experiments in this direction—to see whether it would be as economical to use the wood with cannel coal as to use the ordinary coal. This would do away certainly with the large amount of coke which they had, and which was very annoying in the works. The charcoal, which would be the residual, was valuable out there. The surplus tar was more easily got rid of than coke, as a considerable quantity was simply run off into the sea—he (the Chairman) thought sometimes nearly half of the make, which could not be disposed of. Mr. Newbigging was most assiduous in the discharge of his duties. He maintained friendly relations with the President and the various authorities; but he had great difficulty in getting money out of them or obtaining fair play any more than the Company's former Managers had done. He had succeeded by hard work, and by closely following up the lamp inspectors, in getting the fines considerably reduced; and he was also memorializing the Government at the present time to have the amount of fine per lamp reduced. The Company were paid at the rate of 200 reis per lamp per night; but if a lamp was found out, a fine of 500 reis was imposed, which was, in the opinion of the Board, an unjust thing. They hoped their Manager would succeed in getting the fines reduced to the amount at the most that they obtained per lamp. He had also been able to keep the arrears due by the Government to somewhere about the same amount—with very little increase, at all events. He had not yet, however, succeeded in getting a reduction of the dues wrongly imposed; the great difficulty being to get the returns for Rio made by the Custom House authorities in Pará. Every difficulty was thrown in the way, and time was lost; and although the Manager assured them that things were now moving a little better, and that shortly they might expect to receive them, they had not done so up to the present. The Board were glad to say, with regard to the petition they sent to Rio that the British Consul at Pará had received instructions from Her Majesty's representatives to see that the Company had justice done them. He himself (the British Consul) did not hold out much hope; inasmuch as, he said, there were several other companies in Pará who were even more hardly dealt with than themselves. It seemed to him and to the Directors that a combination of English gas companies or any others in Brazil should be made. This had been spoken of for a long time; but it had not been even practicable yet. He believed there was some prospect of the Brazilian Government coming to England for a loan. If that should be the case, then they thought it would be a good time for a combination of this kind, and they would make generally known to the investing public the treatment that investors in Brazil have received at the hands of the Government. He must not forget to mention that on the 1st of October last, the Manager, under great pressure brought to bear upon him in the interpretation of a clause in their concession reduced the price of gas to the private consumers fully 25 per cent. The clause in the concession was interpreted differently by the Directors; and Mr. Rumball, who was the Engineer and the concessionaire of the Company at the outset, also said it bore a different interpretation. The clause referred to read thus: "The contractors or Company will be empowered to contract with private individuals for the lighting of their houses and establishments at prices that shall not exceed those paid for such services in Rio de Janiero." Now, the Company were not charging prices exceeding those at Rio up till the time of the winding-up of the late Company; and Mr. Rumball assured the Board it was thoroughly understood that this clause referred to the prices charged by the Company then in existence. The price charged by the new Company in Rio was considerably less; and they had consequently to reduce the price in Pará. Mr. Newbigging had taken the opportunity of advertising this reduction largely; and he anticipated a considerable increase in the number of consumers. In a letter received from him the other day, however, he said the increase had not been so great as he expected; and he thought this was largely owing to the bad state of trade in Pará at the present time; but with the revival of trade, he felt sure that this low price would enable him to get a large accession to the number of consumers, and the Board most earnestly trusted this would be so, as with the low price, it would be hard for them to earn the dividend. They also hoped it would have a good effect in another direction—that was, in the

Government not being so hard upon them as in the past. One month they actually had no fines in the public lamps at all; but whether or not this was an indication of better things remained to be seen. The arrears for private lighting had, he was glad to say, been considerably reduced. Taking the figures for the past three half years, in Sept., 1887, they amounted to £3619; in the next half year, to £3036; and in the one under consideration, to £2903; showing a gradual diminution in the arrears. The next question was that of the £7700 of debentures which fall due on the 31st inst. Of this £4900 had been accepted again by the holders at a reduced rate of interest. The interest at present was 6 per cent.; and they had been renewed at 5 per cent. The remainder, the Directors would pay off at the proper time. There was also the recommendation of the payment of 7 per cent. per annum on the preference shares and 4 per cent. per annum for the half year on the ordinary stock of the Company. These would, if declared, be paid on or after the 1st of February. He had now to propose—"That the report and accounts of the Directors to the shareholders, as presented, be and are hereby approved and adopted."

Mr. E. F. ELLIOTT asked whether the Board thought there was any foul play with regard to the public lights found out—whether the light was put out by animus; because, if so, by a little venality with the police, it might be prevented.

Mr. ENNIS, in seconding the motion, enquired whether the Directors had well considered the question of tar, as one-half of their production seemed a large amount to waste; or whether they had not some land round the works on which they could store the tar; and whether they did not think the Engineer could find an outlet for it in the construction of tar paving and so on.

Mr. CUFF thought the balance-sheet presented some favourable features as well as unfavourable ones. The Chairman had explained, to his mind, the most unfavourable point—that was the decrease in the receipts from private lighting. He was glad to hear that it was not owing to a falling off in consumption; and he thought they might look rather hopefully at this, because he believed the reduced price would lead to a largely increased consumption. He would like to know whether gas was used for cooking in Pará; and if not, whether any effort had been made to bring gas into use for this purpose? In regard to the public lights, he wished to learn if the decrease under this head was caused by a less amount being received on account of the fines being more than last year. Another unfavourable feature, he thought was the bad debts. They were very large for the comparatively small amount of business the Company did; and he inquired what proportion of the bad debts arose from private lighting. He also asked whether the collections were made monthly or quarterly; and whether in the case of doubtful customers security was required. The revenue did not show much elasticity; but rather the contrary on the present occasion. He urged the Directors to keep the expenses down as low as possible; and he more particularly called attention to the large increase in the item of salaries. As to the outstanding amount on public lamps, it appeared that, while they had not received the amount for 1887, they had been paid for the first four months of 1888; and he supposed this had something to do with the making up of the accounts, and adjusting them with the Municipality. On the whole, he thought the Company were progressing, even although they had these drawbacks.

The CHAIRMAN, in reply, said with regard to the question as to foul play in putting out the public lamps, and whether the police could not be got to help the Company, he might say that the Company's difficulty was with the police. The police were made to act as inspectors; and two of them were allotted to go round each night to find out as many faults as they could with the lamps. It often, however, appeared that these rondas, as they were called, made their reports sitting in their office without going out. Although they specified the lamp, and gave the position of it, it had been found on some occasions that there had not been such a lamp as the one mentioned, and sometimes that the lamp was a private one, or an oil-lamp. The Company's Manager, or some one deputed by him, usually went round with these men to check what they were pleased to put down; and by this means they had been able to get the fines reduced. The rondas would go round one night themselves; and fines amounting to 40 or perhaps 50 milreis would be imposed. The next night they were accompanied (say) by the Manager, and they then amounted to perhaps 10 milreis. So long as they were followed by the Company's representatives the fines were very low indeed. As to the question of tar, the Directors were constantly considering the matter; and their Manager assured them that it was absolutely impossible to get anything done with it. The idea of storing it would involve a large outlay for tanks. This had occurred to him (the Chairman); but he found it could not be done.

Mr. ENNIS suggested that it might be burnt under the retorts.

The CHAIRMAN said when he mentioned that they could now hardly move about the works for coke, that was answered at once. Replying to Mr. Cuff, he said the arrangement was for the accounts to be collected monthly. If they were to ask for security, the Company would not get any new consumers. As to the outstanding accounts from last year, there were he thought six months owing, and they had now been reduced to two. This was in consequence of the Imperial Government refusing to pay money for back accounts until they were in a better position. They hoped the next remittance would include the two months still owing. In this matter they were entirely in the hands of the Government. As to the question of cooking by gas, he understood that in Pará the cooking was principally done by means of charcoal fires. The Company at one time tried to make an outlet for coke by altering these charcoal stoves, so as to be able to burn it; but the experiment failed altogether. This matter had been urged on the Manager; but he assured the Board there was nothing to be done in this direction.

Mr. RUMBALL said that the Company had tried the plan of altering the fireplaces of the houses at their own expense, in order to burn coke; but the thing did not succeed. In the early days of the Company, they endeavoured to encourage the use of gas for cooking; but the inhabitants preferred to continue the use of charcoal.

The SECRETARY, replying to the question as to bad debts on private lighting, said that the amount for the past half year was £552 19s. 5d. This was partly provided for in the previous year by the bad debts suspense account, to the credit of which they then had £194 1s. It had been considered prudent to write off another £500.

The motion was carried unanimously.

On the proposition of the CHAIRMAN, seconded by Mr. GIVENS, the dividends recommended by the Directors were declared.

The two retiring Directors (Mr. T. Rumball and Captain J. Walrond Clarke) and the Auditor (Mr. P. Crellin) were re-elected.

Mr. RUMBALL, in acknowledging his and Captain Clarke's re-election, said that he had a great deal to do with the obtaining of the Company's concession; and it was extremely sad to him to see how the Brazilian Government had met them. The Company were almost the first to take capital into Brazilian undertakings. At first they were treated exceedingly well; but for some cause or other which could not be explained this had changed. The fines on the public lamps from time to time meant nearly 1 per cent. on the Company's capital; and this was very serious. As to his interpretation of the clause in regard to the price of gas, he took it that they were only bound by the price charged by the Company at Rio, whose concession was running at the time the stipulation was made. That Company's concession having terminated, and a new one having been granted, the conditions had changed.

The SECRETARY then read the notice convening the extraordinary meeting.

The CHAIRMAN said that the alteration they now proposed to make in the Articles of Association would enable the Directors to pay an interim dividend on the ordinary stock and the half-yearly dividend on the preference shares without calling the shareholders together. He moved that clause 100, which prescribed that "the Directors may, with the sanction of the Company at any ordinary general meeting, declare a dividend to be paid to the members in proportion to the amounts for the time being called and paid upon their shares," should be altered as follows:—"The Directors may, with the sanction of the Company in general meeting, declare a dividend to be paid to the shareholders, or to any class or classes of shareholders, in proportion to the amounts for the time being called and paid upon their shares; and the Directors, without such meeting, may once in each year pay to the shareholders, or to any class or classes of shareholders, such sum on their paid-up share capital on account of dividend on their shares as, in their judgment, the position of the Company justifies."

Mr. GIVENS seconded the motion, which was unanimously agreed to.

The usual complimentary vote was then passed to the Chairman and Directors, on the motion of Mr. CUFF, seconded by Mr. T. GUYATT; and the proceedings terminated.

THE GENERAL GAS LIGHTING AND HEATING COMPANY OF BRUSSELS.

The Annual General Meeting of this Company was held in Brussels on the 27th ult., when the report presented by the Directors, embracing the working of the undertaking in the twelve months ending Aug. 31 last, showed an improvement as compared with the previous year. This will be best exemplified by the following comparative figures:—

		1886-7.		1887-8.
Coal carbonized	kilos.	74,540,654	..	77,467,590
Gas made	cub. met.	22 689,794	..	23,650,390
Gas sold	,,	19,392,622	..	20,369,746
Coke produced	kilos.	50,994,508	..	53,753,610
Tar ,,	,,	3,969.761	..	4,173,502
Ammoniacal liquor	hectol.	75,63/	..	80,480
Extension of mains	metres	699,006	..	712 181
Profit on working	frs.	1,851,853	..	1,970,619

The above figures show that the yield of gas was slightly higher last, as compared with the preceding year; and this was equally the case with the residuals. The sale of gas increased by 5·04 per cent., and the profits by 2·15 per cent. The receipts for residuals were about as before. The loss by leakage was decreased to the extent of 43,400 cubic metres, or about 1·30 per cent. The total expenses, notwithstanding an additional sale of nearly 35 million cubic feet of gas, were 2 per cent. less than in the preceding year; and the net profits increased to the extent of 6·41 per cent. These results show that economy has been exercised in the conduct of the undertaking; and the Directors are fully alive to the necessity of making further efforts in this direction, in view of the present position of the gas industry. The Company possess 19 stations of their own; and, in addition, have an interest in two Companies—those at Carcassonne and at Lisbon. The works of the latter are expected to be completed, and the mains all laid, before the close of the present winter; and then operations will begin. The Carcassonne Company set aside 80,000 frs. of their profits as a special amortization fund; and of this sum 38,000 frs. go to the Brussels Company. After deducting from the profits 500,000 frs. for the sinking fund, and allowing 600,000 frs. for depreciation in the value of the plant, the Directors fixed the dividend at 34 frs. per share, or 6·80 per cent. The Directors' report was accompanied by that of the Council of Supervision, as well as by the accounts for the period covered by these reports; and all were approved and adopted by the shareholders.

THE LIGHTING OF MALVERN LINK WITH OIL.

In the JOURNAL for July 24 last, we recorded the fact that the Malvern Link Local Board had decided to light the streets with oil-lamps during the present winter, in consequence of a dispute with the Gas Company as to the price to be paid for lighting—the terms proffered by the Board not being such as could be accepted by the Company. The failure of the oil-lamps on windy nights has brought forth some correspondence in the local papers on the general subject of lighting by oil. One writer, who signs himself "Another Resident," and who defends the Board's action in this matter, contends that the term "retrogressive step," as applied by the opponents to the introduction of oil, is erroneous. Gas-lamps, he says, were used in the London streets nearly 90 years ago; whereas 40 years since mineral oil was unknown, while the immense strides in perfecting the lamps, &c., are of modern date. To prove the "utter superiority" of oil for lighting purposes, he makes use of the various hackneyed assertions in regard to the injury caused to human beings, flowers, &c., by gas, and then points to the well-known "advantages" (?) which the champions of oil lighting are constantly putting forward. First in the list of "important towns" which he gives, where oil lighting has superseded gas with "great advantage," he places Erith; but, as JOURNAL readers are aware, the Erith Local Board do not now appear to be quite so enamoured of the light. "An Interested Resident" replies to this letter, pointing out that "Another Resident" evidently obtained his arguments from the lecture recently delivered by Mr. Defries at New Southgate, which was reported at the time in the JOURNAL.* Referring to the contamination of the atmosphere by gas and oil respectively, the writer says that he has the authority of an eminent chemist and engineer for this statement: "The flame of coal gas and the flames of several combustible bodies that gave an amount of light equal to it were burned separately in given quantities of atmospheric air; and the times were noted at which the flames were extinguished by the contamination of the air. Colza oil was extinguished in 70 minutes; the highest point reached was by cannel gas, 152 minutes; while ordinary gas of 18-candle power lasted 120 minutes." "It therefore appears," he continues, "that there is a far greater amount of carbonic acid (vitiated air) given off by oil than gas with an equal illumination. Approximately, gas requires twice its weight of oxygen, and oil three times its weight for proper combustion. Oil would therefore give off one-third more carbonic acid." In his rejoinder, "Another Resident" thinks that the facts stated on the authority of an "eminent engineer" point to the opposite conclusion to that arrived at by "An Interested Resident," that there is a far greater amount of carbonic acid given off by oil than gas with equal illumination. So far from understanding the subject in question, he says that his opponent confounds the absence of oxygen with the presence of carbonic acid. "Does he not know," he asks, "that if pure hydrogen had been consumed in a given

* See Vol. LII., p. 991.

volume of atmospheric air, that, after a certain lapse of time, the flame would have been extinguished, while not an atom of carbonic acid would have resulted therefrom? . . . . Moreover it is not carbonic acid, but the sulphur compounds in gas that vitiate the air." The letter concludes by saying that the writer's concern is, in common with other poor residents of the district, to prevent "interested residents" from mulcting them any longer in the sum of £203 per annum (for about £70 worth of gas, reckoned at 4s. per 1000 cubic feet), while they can have a better light for less than half the money.

THE PETROLEUM INDUSTRY OF CANADA.

Some interesting information on this subject has appeared in the "Official Journal" of the Board of Trade. It appears therefrom that the oil-producing territory of Canada is situated in the county of Lambton, Ontario; the greatest number of producing wells being in and about the thriving town of Petrolia, at which place the refineries are located. Consul Farrar, of Port Sarnia, Ontario, says that as far as yet developed, the paying wells are confined to a belt of land, 2 miles in width and 16 miles in length, situated about 16 miles east of Port Sarnia, and extending nearly parallel with St. Clair River. The oil territory is divided into two districts—namely, Petrolia and Oil Springs. The annual production of crude oil in Petrolia averages from 350,000 to 450,000 barrels; and the production at Oil Springs is placed at 150,000 to 200,000 barrels—making the total annual average production of crude oil 600,000 barrels for the entire region. There are nine refineries in operation at Petrolia, which, in connection with the wells and other works incident to this industry, give employment to about 3000 men, sustaining a population of about 8000 people. The total quantity of refined oil for illuminating purposes manufactured from the crude averages 250,000 barrels. The capital invested in the oil business is estimated at £572,000. The oil producers of Canada have been obliged to develop a high degree of ingenuity and improvement upon every plan tending to lessen the cost of sinking wells and the expense of pumping the oil. They have so far succeeded that the cost of sinking wells 475 feet—the depth required—has been reduced from £600 to £100, including casing and pump complete; and the expense of pumping from £1 to about 1s. each well per day. If such were not the case, the oil industry could not be made to pay, as the great majority of wells produce only from 3 to 10 barrels daily.

The following is a description of the methods of, and appliances for, drilling and working the wells. The surface, or drift earth, is bored with an auger to the rock (which ranges from 60 to 150 feet from the surface), and a 10-inch wooden tube driven down to the rock. The rock is then drilled with a 5-inch bore a depth of about 150 feet, and iron casing driven down. This casing is intended to shut out the surface water, which, if admitted, would prevent the free secretion of the oil, and would, by coming into contact with sulphur deposits, produce "black water," which is very injurious to the iron tubing of the pumps. The buoyancy imparted to the tools and cable by the 300 or 400 feet of water is avoided, and the presence of oil is discovered at once by the solid tools or by escaping gas. The drilling is continued until oil is struck; and the well is then ready for the pump. This is an iron tube 1½ inches in diameter, and composed of various lengths, at the end of which is the working barrel resting upon a strainer or perforated iron tube to keep out obstructions. In the working barrel are two valves—one to take in and the other to let out; and the oil passing through the strainer is lifted by the pump to the surface. In early days, it was necessary to provide an engine for each well; but now, by the improved "jerker" system, one engine will drive 20 or 30 pumps, or even more than that number. A wheel or circular horizontal table is connected with the engine by the elbow joint in such a manner that it is made to perform a quarter revolution and return to its former position. To this wheel is attached a number of "jerkers" or poles, usually made of white ash, 2 inches square, with iron connections, by which power is conveyed to a number of pumps extending over a large area, and working them all simultaneously. By this plan wells that would not otherwise pay running expenses are worked at a profit.

Crude oil is composed of hydrocarbons of different gravities and boiling points. In distillation these hydrocarbons separate and come off as follows:—(1) Naphtha, which is too inflammable to be used as illuminating oil, and is sold chiefly to paint manufacturers, although it is also used in other industries; (2) illuminating oil; and (3) the oils too heavy for illuminating purposes. The lightest of the latter is sold to gas-works as gas oil. What remains after the paraffin wax is expressed is manufactured into lubricating oil, wool oils, vaseline, hair oils, &c. Consul Farrar says that, on account of the fact that thus far the refiners have not been able to remove the presence of sulphur and other impurities from Canadian oil, which causes a disagreeable odour when used for illuminating purposes, large quantities of refined oil are imported from the United States and Canada, as is shown by the fact that, notwithstanding the duty of 7½ cents. per gallon, about 200,000 barrels of oil from the United States are used annually in Canada, retailing at 30 to 35 cents, as against Canadian oil at 15 to 20 cents per gallon. There are 3200 oil-wells in the districts of Petrolia and Oil Springs; and the total value of the output of petroleum and products in Canada for the year 1887 is estimated at £400,000.

THE ALLEGED LEAD-POISONING BY THE BRADFORD CORPORATION WATER.

At the Meeting of the Bradford Town Council last Tuesday, Alderman Robertshaw, in moving the confirmation of the minutes of the Water Committee, said he had no doubt that the members of the Council had seen reports in the papers during the last few weeks respecting alleged lead-poisoning by Bradford water in some of the out-townships. This matter had been before the public now for several weeks; but no communication respecting it had been received by the Corporation until Wednesday last. On that day the Town Clerk had a letter from the North Bierley Local Board with regard to the alleged poisoning, and asking if a deputation from that body could see the Water-Works Committee. The Town Clerk answered the letter, and asked for tracings of the mains from which the Board obtained water. The letter had not yet been answered; but he could assure the members of the North Bierley Board that when their reply came, they would have every attention, and their deputation would, when convenient, be met upon the point in question. There was one matter of a very delicate character, and one upon which he was not going to give an opinion inconsistent with due care—he referred to the report of the medical officers of health for the districts from which the complaints came. He admitted that these gentlemen might, from being on the spot, know more about the matter than he did at present; but in order to allay any fear on the part of the people of the districts, he would state a few points which perhaps might put a different complexion on the case. If there was one thing about which the Bradford Corporation were particular, it was as to the quality and purity of the water they supplied. The borough was served from the high-level and the low-level systems; and if a preference must be given, it must be to the high-level. The high-level had been a source of supply for 25 years; and during the whole of that time, the excellent quality of the water had undergone no alteration whatever. It so happened that the districts in which the alleged lead-poisoning had taken place were supplied with high-level water, and had been served from that source ever since the Corporation undertook to supply them. Further than this, the Corporation supplied twelve other townships which had been on the high-level system for a great number of years. Another fact which strengthened his case was that ever since water was taken from the high-level, it had been consumed in Bradford by a large number of people; and up to a few weeks ago, when the allegations mentioned were made, there had not been a single complaint—at least since he became a member of the Committee—that the water was impregnated with lead. He saw from a newspaper report that one of the members of the North Bierley Local Board had stated that the water which they were receiving from Bradford was in such a condition that it was not fit to wash with. Who was at fault? The Corporation were not responsible for the Board's mains, because the Board had a Water Committee. The water which they received went through a meter; and he believed that the cause of the water not being in the required condition was that the Board did not flush their pipes sufficiently, and they thus must not be surprised if the water was not so pure as that consumed within the borough. The minutes were confirmed.

It is reported that the number of persons suffering from lead-poisoning occasioned by drinking the water supplied by the Bradford Corporation is on the increase, particularly in the Low Moor and Wyke districts; and it was ascertained last Thursday that there are now about 10 cases in Wyke, 27 in Low Moor, and 2 in Buttershaw. Happily these are mostly of a mild character; but in two instances in Wyke the symptoms have been dangerous to life. The mains through which the water is supplied are of iron, and the whole cause of the mischief is the lead service-pipes.

THE FILTRATION OF THE SOUTHWARK AND VAUXHALL COMPANY'S WATER.

In his report for November (issued last Wednesday), Major-General De Courcy Scott, the Water Examiner for the Metropolis, alludes to the unsatisfactory condition of the filters belonging to the Southwark and Vauxhall Company at Hampton. He says: The filters are in an unsatisfactory condition. They have been in constant use for a number of years; and the body of the material has become greatly loaded with the suspended matters present in the river water. It is very necessary, in order to ensure efficient filtration, that this material should be thoroughly washed. The thorough cleansing of these filters has been contemplated by the Company for some months, and should be taken in hand with the least possible delay. There has recently been visible an abnormal quantity of suspended matter in the samples of water drawn from the collecting wells attached to the filters in question. It has been stated in previous reports that this Company has been engaged in extending their works for flooding the natural beds of Thames ballast, and collecting the water therefrom. The works at Platt's Eyot are approaching completion. A proportion of the water drawn from these gravel beds by this Company is at present being pumped directly into the trunk main to Nunhead for distribution, and is not passed through the artificial filters. But the flooding and collecting works should be regarded merely as substitutes for settling reservoirs; and all the water for the supply of London derived from this portion of the Thames should be filtered through selected materials of known efficiency, or, in other words, should pass through the ordinary filters of the Company. This course is adopted by the Grand Junction Company, whose works adjoin.

THE SERIOUS COMPLAINTS AGAINST THE QUALITY OF YEADON WATER.

At the Meeting of the Yeadon Local Board last Wednesday week, Dr. Usher attended, and said that, though he made serious complaint at the previous meeting in regard to the gathering-ground of the Yeadon Water Company, no action had been taken in regard thereto. He therefore felt impelled to come again; and this time he had brought with him samples of the kind of material—nightsoil, human excrement, &c.—which was being spread on to the gathering-ground of the Company. The doctor here produced a pail containing solid refuse of the kind referred to, and also a large bottle filled with a nasty black-coloured liquid, both of which had been taken that afternoon from off one of the fields comprising the gathering-ground, and which was situated close to one of the reservoirs. The doctor mentioned that he should send the samples to the Local Government Board. The bottle, he said, contained liquid which went into the Company's mains; and it corresponded with samples that had periodically been taken from taps in different parts of the town. He thought a more disgraceful state of things could not possibly exist; and hoped the Board would take immediate action in the matter. The Doctor's statement that part of the gathering-ground was being covered with manure was corroborated by Mr. Lee and Mr. Biltcliffe, who had been deputed by the Board to examine the ground referred to; and both these gentlemen agreed that it was a state of things which should not be allowed to exist. A long discussion ensued; and it was ultimately decided to hold a special meeting to consider the matter. This meeting was held last Thursday, when a long discussion took place. Mr. Biltcliffe said the manure heaps were laid right across the field, with the exception of about six or seven yards from the wall; and in this statement he was supported by another member. Mr. Lister said that a week had elapsed since Dr. Usher produced his samples; and there had been rain in the interval. This being so, if what Dr. Usher said was correct, the water would have been fouled when taken from the taps, but that fact had not yet been demonstrated. Mr. Flaxington said that no civilized community would tolerate such a state of things as had been disclosed; and the only way to settle the question was to have an inquiry by an impartial person. Mr. J. W. Harrison, the Secretary of the Water Company, attended the meeting, and having produced a plan of the Company's gathering-ground, called two witnesses to prove that the samples shown by Dr. Usher were not taken from places where they could possibly get into the reservoirs. He also produced a certificate from Mr. Clark, the Surveyor to the Rawdon Local Board, in whose township the alleged pollution was taking place; and he gave it as his opinion, after having visited the ground in question, and made inquiries respecting the drains, that it was not likely that any liquid matter would percolate therefrom into the reservoir belonging to the Company. Dr. Usher was also present, and stated that what he had said at the last meeting was absolutely correct; and he was prepared to abide by it. He distinctly said that the samples he produced were taken from the gathering-ground of the Company; and they had been sent to the Local Government Board. Mr. Coupland (who is the Chairman of the Water Company) said the first thing was to have the water analyzed, to prove whether it was bad or not; and he proposed that samples should be taken from the taps at different parts by a disinterested person, and examined by a competent analyst selected by the Clerk of the Board After further discussion, this suggestion was adopted.

NOTES FROM SCOTLAND.

(FROM OUR EDINBURGH CORRESPONDENT.)

EDINBURGH, *Saturday.*

Sir Frederick Bramwell's opening address to the Heriot-Watt College, Edinburgh, on Thursday night, was, to my mind, rather a slipshod production. Gas-engines, according to him, "were coming into use, and were most convenient and economical;" and, again, "they had results from them that exceeded anything they knew of steam-engines." This is something to be thankful to Sir Frederick for; but it is curious to note that he was able, later on, to state definitely that, whereas formerly there were steam-engines which consumed 18 lbs. of coal per indicated horse power, they now obtained an indicated horse power with under 2 lbs. of good Welsh coal, but that he could not give any estimate of the advantage which is gained by the use of gas-engines. This becomes all the more matter of curiosity when, further on, he begins to treat of electrical transmission, and ventures the assertion that "he dared say there was no branch of physical science which in this day was more pursued, or in which more interest was taken, or about which there was more reasonable ground for hope." What is Sir Frederick's "ground" for hope in connection with electricity? Is it the experience of the past? If so, why did he not state distinctly what percentage of power it is possible to transmit by means of electricity. Gas has a record in that way, which he admitted, but did not give. He did not go the length of saying that electricity had any record in that direction; and yet he has "ground for hope" with reference to it. It is evident that his love is with electricity; for "it is the most convenient form of energy." "It is rapidly produced; and it is used in multifarious ways." Sir Frederick had just told his hearers that electricity was not a prime mover; and in the sentence following, he goes on to apostrophize about the saving of fuel in generating steam to drive a dynamo, which points to this, that before you can "rapidly produce" electricity, you must wait upon the generation of steam. In that sense gas power may also be said to be rapidly produced, and water more than either. Then he says of electricity that it "is used in multifarious ways." Well, so is steam, so is gas, so is water, so is wind, and so is hand power; and thus electricity possesses no advantage in that respect. Sir Frederick did not say that electricity could be more economically used, either in the form of power or light, than any other; all he ventured to say was that, as compared with gas, they would save fuel by generating steam to produce electricity. To save fuel is one thing; to save cost is another, and he did not touch upon this branch of the subject. He told his audience that the electric light was "so wholesome, so pleasant, and so desirable in all sorts of ways, that people found after all they must manufacture electricity for themselves, if they could not get it otherwise. This was a wail upon the state of legislation in this country. How many people have found that they *must* manufacture electricity, he did not say. The address was, on account of the blemishes I have tried to point out, of no value whatever to students in the department of motive power or lighting, in respect that it furnished them with no data whatever. It dealt in an abstract way with the subject of motive power, leading up to great expectations from electricity, without taking into account the possibilities of other sources of power. Now there can be no objection, in some respects, to Sir Frederick, or anyone else, handling his subject in that manner. Neither students nor men of science will be affected by an address which tells them nothing; but there is danger that the unth inking public may take it for granted that there is meaning where there is none, and may foolishly support adventures which posseas "good grounds for hopes," but possess nothing else. Such things have happened. Only this week a legal gentleman in this city told me that he some time ago settled up a piece of business for a professional friend of his, who had been induced by the vague utterances of scientific gentlemen to invest in electric lighting, and whose loss amounted to the sum of £6000. Sir Frederick cannot desire that such things should happen again; but why did he not make sure that they would not? A few figures would have done that. These he did not give; and without them his address can be of value to no one, except, perhaps, the promoters of projects for the supply of electric light and power.

There are complaints against the quality of the gas in Edinburgh; and these, on the best of all authorities—that of my own eyes—I have no hesitation in saying, are entirely without foundation. At the meeting of the Edinburgh Town Council on Tuesday, Mr. James Robertson stated that he had a great many complaints from citizens about the quality of the gas; and Mr. Macpherson said it certainly was inferior to what the gas companies supplied. Bailie Walcot remarked that he also had received complaints; but that in his own house the light was just as good as ever it was. Mr. Macdougald, who originally moved the Council to agree to have a periodic analysis of the gas, suggested that the analysis should be taken in the evening instead of during the day, because the quality was better during the day time than at night. This was agreed to. The analysis which raised the question related to Dec. 22, when the gas at the Edinburgh works was reported to have been 28·8 candles, and at the Leith works, 26·2 candles.

There was rather an animated discussion at the meeting of the Aberdeen Town Council on Monday, in regard to the alleged overcharges for gas. Seeing that the agitation began in the early part of last summer, there is an appearance of tardiness in the action of the Gas Committee in allowing it to stand over for disposal until now; and this remark is not affected by the consideration that the agitation was of a paltry character, for, no matter although it was trifling as regarded its extent, it was persistent, and as a matter of policy ought not to have been permitted to run so long. However, the subject in its present form has at last been disposed of; and I think satisfactorily. But Mr. Pratt's remarks, taken in conjunction with his general behaviour, lead me to expect that it will be renewed over the accounts recently sent out. In moving the adoption of the report of the Committee appointed to inquire into the matter,* Mr. Collie, the Convener of the Gas Committee, did something in the nature of a smart thing, when he produced Mr. Pratt's own accounts, and showed that, so far from there having been an increase in his case, they showed a large decrease. Baillie Gordon having seconded the motion, Mr. Pratt said he thought the report was not satisfactory; and he moved that it be referred back to the Committee. This was seconded, in order to elicit discussion, by Dr. Moir. After a full consideration of the subject, a vote was taken, when 21 members were in favour of the motion, and no one supported the amendment.

The advocates of electric lighting have prevailed on the Building Committee of the Victoria Art Galleries in Dundee to consider the question of lighting the galleries and the Albert Institute by electricity. A meeting of the Committee was held on Thursday, at which a report by Mr. W. A. Bryson, Electrician to the Edinburgh, Manchester, and Glasgow Exhibitions, was submitted. This report showed an estimated initial cost of £2800; and the annual cost to be £180 for working expenses, and £443 for renewals and depreciation—together £623. An estimate of the cost of gas lighting was stated at fully £300. This seemed to stagger the Committee; and it is announced that "after careful consideration, the question was remitted to a Special Sub-Committee with instructions to go minutely into the estimates, with the assistance of professional opinion."

Dissatisfaction was expressed with the lighting of the town at the meeting of the Dingwall Town Council on Thursday. One speaker mentioned that the lamps were as far apart as 140 yards. The discussion developed into a kind of charge against the Lighting Committee that they were insufficiently lighting the streets, in order to keep down the gas account; and this brought out the remark that the price of gas was 10s. 10d. per 1000 cubic feet. At such a price, there need be no wonder that economy is studied. The Lighting Committee were asked to consider how the lighting arrangements could be improved.

* See JOURNAL, Vol. LII., p. 1033.

(FROM OUR GLASGOW CORRESPONDENT.)

GLASGOW, *Saturday.*

At the meeting of the Philosophical Society of Glasgow on Wednesday, the Secretary (Mr. John Mayer) submitted a comprehensive biographical notice of the late Dr. William Wallace, Past-President of the Society, which he had prepared at the special request of the Council. Considerable prominence was given to the work which Dr. Wallace did in connection with the science and practice of the gas industry and to the eminent position which he had long held as an expert in gas matters. This communication was followed by a joint paper by Mr. James Chalmers, architect, and Mr. Wm. Key, of the Tradeston Gas-Works, on "A Scheme of Cremation suited to the requirements of Glasgow." In the course of the paper there were described several crematories, particularly that of Mr. Frederick Siemens, in which the principle of gas-firing and heat-regeneration is taken advantage of; and subsequently Mr. Key described a crematory furnace which he had designed, and which could be erected at a cost of about £150. This furnace was so devised that coke might be used as the fuel, and the regenerative system turned to account in working it, while the cremating of a body in it could be done in half an hour. In the course of the discussion which followed, it was urged that the retorts of gas-works might be used for the purpose in question. It was very evident that the idea of cremation, if practically carried out in accordance with the dictates of science, was regarded with much more favour.

In the Bill Chamber of the Court of Session on Friday, before Lord Wellwood, application was made on behalf of the Coatbridge Gas Company that interim interdict be granted against the Town Council of Coatbridge and their Lighting Inspector, on the ground that the metered lamps are not being lit at night as soon as those which have no meters attached, and are being extinguished a considerable time before the latter. As the lamps which are provided with meters afford the only measure for fixing the average amount of gas supplied through the whole of the lamps, the complainers allege that the Council's conduct is very unfair and prejudicial to their interests. His Lordship refused the application, and ordered the note to be served and answers to be lodged in four days.

This matter was mentioned at the monthly meeting of the Coatbridge Town Council on Thursday. The Town Clerk read from a minute of the Lighting Committee that, with regard to certain tamperings with the gas-meters attached to the street lamps for the purpose of ascertaining the average consumption, he had explained the matter to the Committee, and that he had since reported the affair to the Procurator-Fiscal. In the Lighting Committee's minutes, which were subsequently submitted, it was stated that it had been agreed to pay for gas supplied to the lamps by meter, and that the question of the number of meters, about which there was some dispute with the Gas Company, should be remitted to Sheriff Mair for arbitration. Mr. Lindsay, a Director of the Company, remarked that it was not the case that the matter had been left to the Sheriff for arbitration. Mr. Sharp, Convener of the Lighting Committee, stated that a meeting had been held in the Company's office, at which there were present the Chairman (Mr. M'Lachlan), Mr. Lindsay, and two other Directors, and himself; and that he had informed them that the Committee were prepared to renew the lighting contract on condition that the Company took 5s. off the charge for the gas for each lamp. This, however, was not conceded. They offered to lower the charge 3s. 9d. per lamp; but he (the Convener) said that the Committee wished 5s. off or nothing. The Committee also wanted the number of gas-meters reduced; but the Directors would not agree to that proposal either. He (the Convener) had proposed to remit the matter to Sheriff Mair; and they said "Agreed." This, he said, was the whole negotiation. Mr. Lindsay again affirmed that it had not been decided to remit the matter to the Sheriff, and that the Directors proposed to refer it to other Gas Companies. The matter then dropped; but it is evident that the relationship between the Council and the Company is in a somewhat strained condition, which may require the drastic treatment of an action in the Court of Session; the mild measure of remitting the case to the Sheriff for arbitration not being in accordance, apparently, with the views of the Directors of the Company.

At a meeting of the Hamilton Town Council on Thursday, the Gas Committee reported, on the authority of the Gas Manager, that the cost of the gas made the preceding month was 11½d. per 1000 cubic feet.

Up till Dec. 26 last, the gas-rents collected by the Treasurer to the Glasgow Corporation Gas Commissioners amounted to £73,442, as compared to £81,926 for the corresponding period of the financial year 1887-8. There was thus a decrease of £8483, which can be very satisfactorily accounted for; one leading fact being the reduction in the price to the extent of 2d. per 1000 feet.

The course of the Glasgow pig-iron warrant market this week has been most unsatisfactory for holders. A large quantity of iron has been sold and by powerful operators for the fall, down to as low as 41s. 1d. cash per ton for Scotch iron, and this in the face of the statement by makers that the orders are liberal and the prospects altogether encouraging. Iron continues to go into store, but only in moderate quantity; and it is believed to be at the instance of the "bear" party, who are thus actually relieving the makers of their stocks in order to effect their speculating operations.

A fair amount of activity is showing itself in the local coal trade; the inquiry for main coal being good, and all being reported a shade easier. A rather better tone is observable in the cannel coal department. Miners' wages are about to undergo another increase, it is thought—indeed, one well-known coalmaster who has large dealings has already announced to his colliers an advance of 6d. per day.

THE streets of Blackrod, near Bolton, were for the first time lit with gas at the beginning of the year; and it is stated that on the opening night each lamp received its share of admiring spectators.

THE Tonbridge Local Board have acceded to the request contained in a petition to reconsider the proposed purchase of the local water-works; but it is not probable that the previous decision (not to move for an inquiry) will be reversed.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Jan.* 12.

Sulphate of Ammonia.—The market has had a hardening tendency during the week; and £12 10s. f.o.b. Hull has been freely paid for immediate parcels, of which there were never too many offering. At the close, quotations are higher all round; and although the Continental demand is far from brisk, the disappearance of parcels almost as soon as they are placed on the market is generally commented upon. The only explanation to be given for this strange fact is that large forward sales must have been made by speculators, who are covering their contracts as best and as quietly as they may. Considering, however, the state of the weather, the nitrate market, and the general requirements, a substantial rise is at the moment scarcely to be anticipated; and an attempt to send prices beyond a natural level would defeat its own ends by driving consumers to nitrate. Locally, sulphate is somewhat scarce; while good makes are in request. Nitrate is quoted a little dearer.

LONDON, *Jan.* 12

Tar Products.—Production just now is very large; and this no doubt accounts for the defined weakness in some of the products—notably, anthracene, benzole, and creosote oil. The latter is quite ¼d. per gallon lower on the week; and stocks appear to be accumulating uncomfortably. To-day's prices are: Tar, according to position, 18s. to 24s. per ton. Benzole, 90 per cent., 3s. per gallon; 50 per cent., 2s. 5d. Toluol, 1s. 6d. per gallon. Solvent naphtha, 1s. 3d. per gallon. Crude naphtha, 30 per cent., 1s. 2d. per gallon. Light oil, 3d. per gallon. Creosote, 2d. per gallon. Pitch, 18s. 6d. to 21s. 6d. per ton. Carbolic acid (crude), 3s. 6d. per gallon. Cresylic acid, 10½d. per gallon. Tar salts, 15s. per ton. Anthracene, 30 per cent., "A" quality, 1s. 4d. per unit; "B" quality, 1s. 2d.

Ammonia Products.—Sulphate has more than maintained the firmness mentioned last week; the price having steadily advanced. Prices are as follows:—Gas liquor (5° Twaddel), 8s. per ton, with a rise or fall of 1s. 6d. per degree. Sulphate of ammonia, £12 10s. per ton, less discount. Liquor ammonia, 2d. per lb. Carbonate of ammonia, 3½d. per lb. Muriate of ammonia, brown, £20 per ton; white, £26 10s. Sal-ammoniac, £32 per ton.

From the *Chemical Trades Journal*, Jan. 12.—The year has opened with a decided weakness in the benzol market; although some dealers persuade themselves into the belief that there is no change. There is little change to be noticed in all other tar products. Solvent naphtha is still in good request, at former rates. Creosote is still moving off for burning purposes very easily; and good values are realized almost everywhere. Crude carbolic remains as before; and the same may be said of anthracene. Pitch remains as last week. Sulphate of ammonia has been steadily rising, until it has reached £12 10s. f.o.b. Hull—a price, above which, we believe, it will not be safe to push it, at present, anyhow. It was the fact that this value exceeded the ideas of purchasers a few weeks since, that caused the relapse. The rush of sellers of sulphate into a stagnant or falling market, after having waited in vain for the highest point, and missed it, comes about with the certainty of a recurring decimal. When will sulphate makers study the subtleties of the sulphate market as they should do?

THE WATER SUPPLY OF KINETON.—At the meeting of the Stratford-on-Avon Rural Sanitary Authority, last Friday, it was reported that the Directors of the Kineton Gas Company declined to undertake to supply the town with water, on the ground that so few inhabitants would require it that they did not consider the income would be sufficient to pay the shareholders a remunerative dividend. The Sanitary Authority have decided to discuss the subject again at their next meeting; and the Engineer (Mr. Willcox) has been requested to formulate a scheme, and to report upon the matter.

THE WATER SUPPLY OF READING.—The Water Committee of the Reading Corporation have, with a view to supplementing the present supply, given instructions for an analysis to be made of the water in the Kennet, just above their existing intake, and also instructed Mr. J. H. Blake, geological engineer, to report as to the feasibility and desirability of obtaining near to the present works or otherwise an adequate supply of pure water from the chalk or other formations underlying the district, and generally as to the probable depth of boring or other works necessary for ensuring such supply.

THE BANKRUPTCY OF MR. R. BANNER OAKLEY.—Under a receiving order made against Richard Banner Oakley, described as an electrical engineer, carrying on business in High Holborn, a statement of affairs has been filed, which gives the liabilities at £35,612, with assets £80. The Chief Official Receiver, in his observations upon the case, says that the bankrupt states that he was adjudicated in Rochester about 1873 or 1874, and has not been discharged. He was again adjudicated in London in January, 1876 (when he was described as a banker); and he has not been discharged. The bankrupt says that in November, 1882, he was appointed Manager of the Æolus Water-Spray Company, Limited; and in September, 1884, with borrowed money, he purchased the business, and carried it on until May last, when he executed a deed of assignment for the benefit of his creditors. The bankrupt attributes his present failure to his heavy expenses for interest and charges in respect of borrowed money, advertising, &c., in endeavouring to establish the business of the Æolus Water-Spray Company, and in promoting the business of the Clamond Incandescent Light Company, Limited, as well as realize his shares in that Company, or to get orders for the Companies executed.

THE BRADFORD ROAD WORKS OF THE MANCHESTER CORPORATION.—Alderman Asquith, in a letter to a local newspaper, corrects two statements which he made in the discussion in the Manchester City Council, on the 2nd inst., on the subject of the Bradford Road works. He finds that, instead of 130 or 140 men being employed there, the number is at present (and through the winter months) about 270. The smaller number is the summer staff. He also says that "Mr. John Woodward, the Engineer, was appointed by the Gas Committee not as 'foreman' merely, but temporarily in full charge of the works, and was paid weekly at a certain rate." Mr. W. Magnall, another correspondent of the same paper, defends the policy of the Gas Committee in the erection of the works, on the ground that they are necessary to meet the extra consumption which would occur during a continuous fog of four days' duration. He adds, however: "The Gas Committee is too completely despotic to concern itself with the recent experiences of a quasi-philanthropic local company, or else we might look to have the price of gas reduced to something like a reasonable figure. The reduction could be well afforded, and might be still better so with a more efficient system of management than at present exists. The results would be an immediate and important increase in the consumption, the gas consumers would obtain a measure of redress of injustice, and our most modern, most efficient, and most complete system of gas production would become of the first benefit to the city, instead of being, as it at present is, in danger of becoming reduced virtually to so much old material."

THE PROPOSED NEW WATER-WORKS FOR POCKLINGTON.—A Vestry meeting was held last Friday at Pocklington for the purpose of obtaining the consent of the ratepayers to the proposed new works which the Pocklington Water Company intend to construct, and for which they are now seeking the necessary parliamentary powers. A short explanation as to the proposals of the Company was given by the Chairman (Dr. Trotter); and a resolution was afterwards passed approving of the scheme.

THE COST OF FOGS.—Lecturing at Leeds, some few weeks ago, on the subject of "A Town Fog," Professor Smithells said the great fog producer was sulphur. He had reckoned that about 41 tons of sulphur were burnt in the coal consumed in Leeds; and this went into the air in the shape of sulphurous fumes, while solid particles were present in large numbers, owing to the enormous amount of combustion taking place. The dirtiness of the fogs was due to the smoke. In towns which burnt wood or Welsh steam coal, there were no dark fogs. Fogs had an influence on the death-rate; and they were also costly, as they necessitated additional illumination. A foggy day in Leeds caused the extra consumption of 1,250,000 cubic feet of gas, which was a cost to the ratepayers of £114. It had been computed that the cost to London by the fogs was £5,000,000 per annum. Various plans had been suggested for the dispersion of fogs; but they had not been put to practical use. The only way for townspeople to try and avoid fogs was by the use of less coal, and the greater adoption of gas-fires, heating by hot water, and coke fires.

THE LIGHTING OF PRIVATE STREETS BY LOCAL AUTHORITIES.—At a meeting of the Shirley and Freemantle Local Board last Tuesday, a letter was read from the Local Government Board, adverting to a letter from the Board of Nov. 28 last, with reference to the power of the Board to supply gas for the lighting of private streets and roads which had not been taken over by them; but in which the owners and occupiers had done the structural works necessary for lighting. The Local Government Board stated that they were not aware of any decision which would preclude the Local Board from supplying gas for the purpose of lighting such streets and roads. In the absence of any decision, they pointed out that section 161 of the Public Health Act, 1875, provided that an urban authority might contract with any person for the supply of gas or other means of lighting the streets; and they considered that a Local Board might, under this section, contract for the lighting of lamps in private streets within their district—the cost being defrayed out of the general district rate, should the circumstances of the case be such as to render this course a proper one. It did not appear to them that the fact that the Local Board had contracted and paid for the lighting of private streets would prevent them, as regarded these particular streets, from exercising the powers conferred upon them by section 150 of the Public Health Act.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

(For STOCK MARKET INTELLIGENCE, see *ante*, p. 108.)

Issue.	Share	When ex-Dividend.	Dividend or Div. & Bonus.	NAME.	Paid per Share	Closing Prices.	Rise or Fall in Wk.	Yield upon investment.
£			p. c.	GAS COMPANIES.				£ s. d
590,000	10	12 Oct.	10½	Alliance & Dublin 10 p. c.	10	18—19	..	5 10 6
100,000	10	,,	7½	Do. 7 p. c.	10	12½—13½	..	5 11 1
800,000	100	2 Jan.	5	Australian (Sydney) 5% Deb.	100	110-112*	..	4 9 3
100,000	20	29 Nov.	10	Bahia, Limited	20	24—25	..	8 0 0
200,000	5	14 Nov.	7½	Bombay, Limited	5	6¾—7¼	−¼	5 3 5
40,000	5	,,	7½	Do. New	4	5—5½	..	5 9 1
380,000	Stck.	29 Aug.	11	Brentford Consolidated	100	223—228	..	5 3 1
125,000	,,	,,	8	Do. New	100	165—170	..	5 2 11
220,000	20	13 Sept.	10½	Brighton & Hove, Original	20	43—45	..	4 13 4
320,000	20	28 Sept.	11½	British	20	43—45	..	5 0 0
50,000	10	13 Sept.	11	Bromley, Ordinary 10 p. c.	10	20—22	..	5 0 0
39,000	10	,,	8	Do. 7 p. c.	10	13½—14½	..	5 10 4
328,750	10	14 Nov.	8	Buenos Ayres (New) Limited	10	13¾—14½	..	5 10 4
200,000	100	2 Jan.	6	Do. 6 p. c. Deb.	100	107-109*	..	5 10 1
150,000	20	10 Aug.	7	Cagliari, Limited	20	26—28	..	5 0 0
550,000	Stck.	12 Oct.	13½	Commercial, Old Stock	100	260—265	+3	5 8 9
130,000	,,	,,	10½	Do. New do.	100	212—217	+3	4 19 1
130,000	,,	28 Dec.	4½	Do. 4½ p. c. Deb. do.	100	122-125*	..	3 12 0
557,320	20	13 Dec.	13	Continental Union, Limited	20	46—48	+2	5 8 4
242,680	20	,,	13	Do. New '69 & '72	14	31—33	+1	5 10 3
200,000	20	,,	10	Do. 7 p. c. Pref.	20	37—39	+1	5 2 6
75,000	Stck.	28 Sept.	10	Crystal Palace District	100	205—215	..	4 13 0
234,060	10	27 July	13	European, Limited	10	25½—26½	..	4 18 1
120,000	10	,,	13	Do. New.	7½	18—19	..	5 2 7
354,060	10	,,	13	Do. do.	5	12—13	..	5 0 0
5,468,600	Stck.	29 Aug.	13	Gaslight & Coke, A, Ordinary	100	257—262	+6½	4 19 3
100,000	,,	,,	4	Do. B, 4 p. c. max.	100	100—105	..	3 16 3
665,000	,,	,,	10	Do. C, D, & E, 10 p.c. Pf.	100	261—265	..	3 15 6
80,000	,,	,,	5	Do F, 5 p. c. Prf.	100	125—130	..	3 16 11
60,000	,,	,,	7½	Do. G, 7½ p. c. do.	100	182—187	..	4 0 2
1,300,000	,,	,,	7	Do. H, 7 p. c. max.	100	169—174	..	4 0 5
468,000	,,	,,	10	Do. J, 10 p. c. Prf.	100	260—264	..	3 15 10
1,061,150	,,	13 Dec.	4	Do. 4 p. c. Deb. Stk.	100	117—120	..	3 6 8
294,850	,,	,,	4½	Do. 4½ p. c. do.	100	122—127	..	3 10 10
650,000	,,	,,	6	Do. 6 p. c. do.	100	172—177	..	3 7 10
3,600,000	Stck.	14 Nov.	10	Imperial Continental	100	209—214	+3	4 13 5
75,000	5	13 Dec.	6	Malta & Mediterranean, Ltd	5	5—5½	..	5 9 1
560,000	100	1 Oct.	5	Met. of Melbourne, 5 p.c. Deb.	100	114—116	..	4 6 2
541,920	20	29 Nov.	6	Monte Video, Limited	20	19—20	..	6 0 0
150,000	5	29 Nov.	10	Oriental, Limited	5	9—9½	..	5 5 5
60,000	5	28 Sept.	7	Ottoman, Limited	5	6—7	..	5 0 0
166,870	10	27 July	4	Pará, Limited	10	5½—6½	..	6 3 7
				People's Gas of Chicago—				
420,000	100	2 Nov.	6	1st Mtg. Bds.	100	104—107	..	5 12 1
500,000	100	1 Dec.	6	2nd Do.	100	92—97	..	6 3 9
100,000	10	12 Oct.	10	San Paulo, Limited	10	15½—16½	..	6 1 2
500,000	Stck.	29 Aug.	15½	South Metropolitan, A Stock	100	302—307	+3	5 0 11
1,850,000	,,	,,	12	Do. B do.	100	237—242	+3	4 19 2
141,500	,,	,,	13	Do. C do.	100	245—255	..	5 1 11
600,000	,,	28 Dec.	5	Do. 5 p. c. Deb. Stk.	100	137-140*	..	3 11 5
60,000	5	29 Aug.	11	Tottenham & Edm'ntn, Orig.	5	11—13	..	4 4 0
				WATER COMPANIES.				
717,467	Stck.	28 Dec.	9	Chelsea, Ordinary	100	257-262*	+1	3 8 8
1,720,560	Stck.	12 Oct.	7	East London, Ordinary	100	201—204	+1	3 8 7
700,000	50	13 Dec.	9	Grand Junction	50	121—125	..	3 13 0
708,000	Stck.	10 Aug.	10½	Kent	100	277—282	..	3 14 5
1,043,800	100	28 Dec.	9	Lambeth, 10 p. c. max.	100	252-257*	..	3 10 0
406,200	100	,,	7½	Do. 7½ p. c. max.	100	197-202*	..	3 14 3
200,000	Stck.	28 Sept.	4	Do. 4 p. c. Deb. Stk.	100	118—122	+1½	3 5 7
500,000	100	27 July	12½	New River, New Shares	100	350—360	..	3 7 4
1,000,000	Stck.	,,	4	Do. 4 p. c. Deb. Stk.	100	124—128	+1	3 2 6
902,300	Stck.	13 Dec.	6	S'thwk & V'xhall, 10 p.c. max.	100	167—172	+2	3 9 9
126,500	100	,,	6	Do. 7½ p. c. do.	100	160—165	+2	3 12 9
1,155,056	Stck.	,,	10	West Middlesex	100	262—267	..	3 14 11

* Ex div

SHUTTING OFF THE WATER SUPPLY IN MILE END.—At the last meeting of the Vestry of Mile End, Old Town, the following letter, dated Jan. 8, was read from the General Superintendent of the East London Water-Works Company:—"In reply to your letter of the 3rd inst., which has been forwarded to me by the Secretary, stating that your Vestry had received complaints of shutting off the supply for a long time, I am unable to make any satisfactory investigation, as the 'cases particularly referred to as occurring in the neighbourhood of Commercial Road' are not specified in your letter. The mains throughout the Company's district were shut down on the night of Dec. 13 for a few hours by order of the Company's Engineer for a special purpose; but this would hardly affect the property to which your complaint probably applies, unless the houses thereon are unprovided with storeage cisterns to meet similar emergencies. Your Vestry must be well aware that it is impossible to avoid intermissions of supply from time to time from various causes, such as broken mains, the freezing of lead pipes, and for the making of new connections and alterations. If you will oblige me with a list of the cases referred to, I will go further into the matter." No action was taken by the Vestry.

WATER SUPPLY AND DISEASE.—A timely, though small, illustration of the association of water supply and disease (upon which subject an article appeared last week, p. 63) is furnished by the populous village of Underwood, the inhabitants of which obtained their supply from an open stream and wells. At the last meeting of the Plumpton Rural Sanitary Authority, a letter was read from the Local Government Board, asking for the observations of the Authority on a letter which they had received from Mr. T. G. Taylor—a property-owner at Underwood. Mr. Taylor in his letter drew the attention of the Board to an outbreak of fever in the village, which he attributed to defective water supply. The stream, from which the supply was chiefly taken, he believed to be contaminated with refuse from the houses and drainage from the highways, and he also considered the private wells were likely to be contaminated with sewage. On the same occasion a letter was read from the vicar of Tamerton (the Rev. E. Roberts), in which he commended the resolutions passed at a public meeting of the parishioners, on the 26th ult. They were—"That this meeting protests against any further outlay on the works for the water supply; being of opinion that sufficient water for the village cannot be obtained from this source, as after so much rain the stream is scarcely adequate for the purpose intended, and that in a dry season it would fail." "That no confidence can be placed in management which allows dry weather to slip by, and searches for water in a rainy season." Although so important a subject, the report in a local paper states that, after a few observations from the sanitary officers, "the subject dropped without any decision being arrived at."

THE PUBLIC LIGHTING OF SLOUGH.—The *Windsor Express*, writing recently on this subject, says: "The question of artificial illumination is at the present time greatly exercising the general municipal mind, because of the changed circumstances which have lately gathered around it; but recent developments will not probably soon affect this town—though there is a project afloat for the lighting of the Royal borough by electricity; and whatever competition or comparison may or may not do hereafter in the way of changing prices, gas-lamps will doubtless continue long to be the sole means of supplying more or less light to Slough streets. That they may supply more is the wish directing these observations; for demonstration of no sort is wanting to prove that, under existing arrangements, the thoroughfares of this place everywhere reveal a marked insufficiency of light as soon as night falls. Solution of the difficulty is alone to be found in the provision of an increased number of lamps. At present, connected with eight miles of mains in Slough, there are only 112 lamps; whereas in Eton, distributed along a single mile of main, there are between 70 and 80 lamps. The quantity of gas consumed by each lamp is regulated to 4 feet per hour, and could easily be added to; but very little improvement would be effected in this way, inasmuch as the lamps are so far apart. Intermediate lamps are required; and great advantage and satisfaction would assuredly follow their numerous and speedy introduction. Under the current contract between the Local Board and the Gas Company, the amount charged per lamp per annum, including lighting and cleaning, is £2 5s. Within the past ten years it has been as high as £2 15s.; on the last contract it was £2 7s. 6d.; and the erection of further lamps would be the surest way of reducing it to £2 2s. 6d., or lower, since the more lamps the Company supply, the cheaper can they furnish their commodity."

GWYNNE & CO., ESSEX STREET WORKS, VICTORIA EMBANKMENT, LONDON, W.C.

GWYNNE & BEALE'S PATENT GAS EXHAUSTERS & ENGINES.

Telegrams: "GWYNNEGRAM, LONDON." Telephone No. 2698.

Exhausters of nearly all sizes in Stock.

Prize Medals at all the Great International Exhibitions.

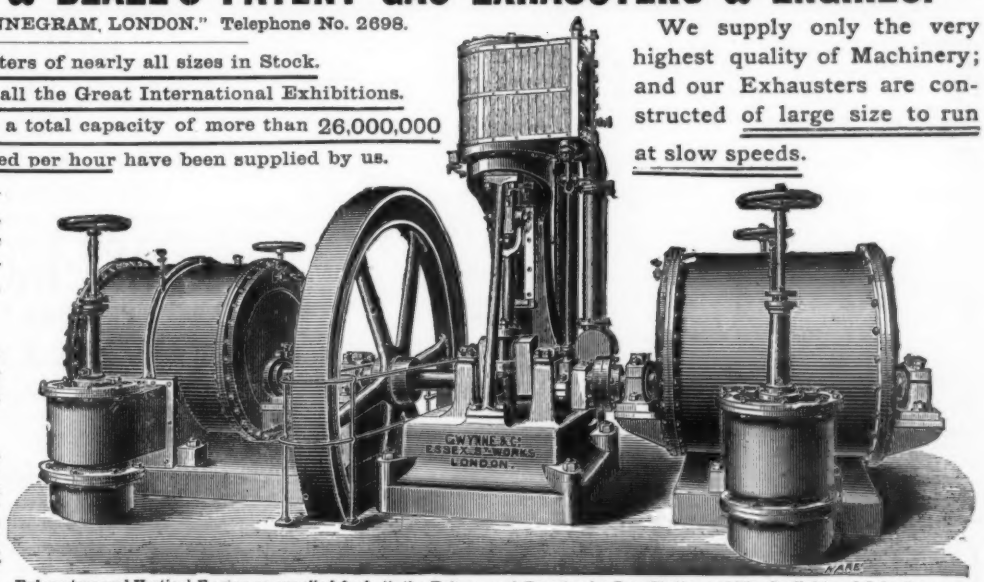
Exhausters equal to a total capacity of more than 26,000,000 cubic feet passed per hour have been supplied by us.

Our new Patent Non-Fluctuating Exhausters, to work without the slightest oscillation or variation in pressure, are strongly recommended.

MAKERS OF EVERY DESCRIPTION OF HYDRAULIC AND GAS MACHINERY.

Gwynne & Co.'s New Catalogue and List of Testimonials can now be obtained on application.

We supply only the very highest quality of Machinery; and our Exhausters are constructed of large size to run at slow speeds.



Exhausters and Vertical Engine as supplied for both the Fulham and Bromley-by-Bow Stations of The Gaslight and Coke Company.

OXIDE OF IRON.

O'NEILL'S Oxide has a larger annual sale in the United Kingdom than all other Oxides combined. Purity and uniformity of quality guaranteed. Pamphlet, "How to Purchase Bog Ore," to be obtained on application.
Gas Purification and Chemical Company, Limited, Palmerston Buildings, Old Broad Street, London, E.C.
JOHN WM. O'NEILL, Managing Director.

ANDREW STEPHENSON, Agent for the GAS PURIFICATION AND CHEMICAL COMPANY, Limited, Palmerston Buildings, Old Broad Street, LONDON, E.C.

CANNEL COAL, &c.

JOHN ROMANS & SON, EDINBURGH.
Gas Engineers, supply all the most approved SCOTTISH CANNELS; also FIRE-CLAY GOODS, CAST-IRON PIPES, and other APPARATUS for GAS AND WATER WORKS.
Prices, &c., will be forwarded on application to No. 30, ST. ANDREW SQUARE, EDINBURGH, } SCOTLAND.
No. 54, BERNARD STREET, LEITH. }

WANTED, by a Total Abstainer, a Situation in a Gas-Works as WORKING MANAGER or FOREMAN. Has had good practical experience in Carbonizing, Fitting, Main and Service Laying, Reading Meters, and Repairs connected with Gas Plant. Good testimonials. Married.
Address No. 1668, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, by the Sligo Gas Company, a competent GAS-FITTER.
State age, present and past employment, and wages required, to
C. B. TULLY, Manager and Secretary.

TIMMIS & CO., of STOURBRIDGE
Make only the best quality of FIRE-CLAY RETORTS, BRICKS, TILES, & LUMPS. Also SPECIAL SILICA BRICKS, to stand great heats.
All descriptions kept in Stock.
For Prices apply to JAMES LAWRIE AND CO, 63, Old Broad Street, E.C., Sole Agents for London and District. Telegraphic Address: "EIRWAL, LONDON."

ALEX. WRIGHT & Co., 55, 55a, and 56, MILLBANK STREET, LONDON, S.W.
[Telegraphic Address: "PRECISION LONDON."]
Makers of Wet and Dry Gas-Meters, Station Meters and Governors, Photometers, and Gas-Testing Apparatus, Test Gasholders and Meters, Registering and other Gauges, &c., &c.
*** See Advertisement on Page III. of the Wrapper of this week's issue.

W. C. HOLMES & Co., Huddersfield, AND 80, CANNON STREET, LONDON,
Contractors for Gas-Works complete, Makers of Gasholders, Purifiers, Scrubbers, Condensers, Retort Fittings, &c., Improved Valves, Engines, and Exhausters. Also for Collingwood's Regenerative Retort-Settings.
*** See Advertisement p. 88 of last week's issue.
Cablegrams: "Ignitor London." Telegrams: "Holmes Huddersfield."

WANTED, Two 30 feet or 25 feet square PURIFIERS (Second-hand), in good condition with Travelling Lifting Crane complete.
The Purifiers to be 6 feet deep, with Lutes 2 feet deep and 9 inches wide.
Price, with full particulars, to be sent in not later than the 23rd of January to the undersigned.
W. WINSTANLEY.
Gas-Works, Newcastle, Staffs.

IRISH BOG ORE OXIDE OF IRON.

GAS PURIFICATION.

BALE, BAKER, & CO., direct Importers from Ireland. Sample and Price on application. Spent Oxide and Sulphate of Ammonia purchased.
120 and 121, NEWGATE STREET, LONDON, E.C.

SULPHURIC ACID.

JOHN NICHOLSON & SONS, Chemical Works, LEEDS, specially produce this ACID for making SULPHATE OF AMMONIA of high quality and colour.
Highest References and all particulars supplied on application.

JOHN RILEY & SONS, Chemical Manu. facturers, Hapton, near Accrington, are MAKERS of SULPHURIC ACID, from Brimstone, for Sulphate of Ammonia making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitrol. References given to Gas Companies.

THE GAS INSTITUTE.

THE Council respectfully request that all SUBSCRIPTIONS and COMMUNICATIONS relative to THE GAS INSTITUTE be addressed to Mr. William Longworth, Gas Offices, Guildford, who has been appointed Honorary Secretary, *pro tem.*
Dec. 29, 1888.

WANTED, by the Clayton, Allerton, and Thornton Gas Company, a young MAN to make Sulphate of Ammonia.
State wages required, and what kind of Plant used to, and, as there is not full work Sulphate Making, what he can do to fill up his time, to
JOHN NIVEN, Engineer and Manager.
Clayton, near Bradford, Jan. 11, 1889.

WANTED, a thoroughly qualified and competent GAS ENGINEER for the Montreal Gas Company, Canada.

Applicants must enclose testimonials, and state age, experience, and salary.

Applications received up to the 31st of January inst., addressed to J. F. SCRIVER, Manager of the Montreal Gas Company, care of Mr. King, 11, Bolt Court, Fleet Street, LONDON, E.C.

*** Mr. Scriver is now in England, and may be seen (by appointment), in regard to this advertisement, by any of the applicants or others wishing to call upon him, at the Grand Hotel, Charing Cross, S.W.

OUTSIDE LAMPS—Suitable for Public Thoroughfare or for Business purposes. Four of Sugg's Patent 150-Candle Power LANTERNS on Iron Columns, in perfect condition, TO BE SOLD cheap.

Apply to Mr. MORTER, Gas-Fitter, 25, Park Street, Camden Town, LONDON.

THE Oxford Gaslight and Coke Company have FOR SALE a Double-Lift GASHOLDER in Cast-Iron Tank, with Guide-Framing complete. Capacity, 90,000 feet.

Offers (including removal) to Mr. ELDRIDGE, Engineer and Manager, who will give any further information.

FOR SALE.

THE Gas Committee of the Corporation of Wigan have FOR DISPOSAL—for which they invite Offers—a quantity of RETORT-BENCH FITTINGS (some equal to new), consisting of Mouthpieces, Ascension-Pipes, Bridge-Pipes, Dip-Pipes, Hydraulic Mains, Foul Mains, Sundry Valves, and Connections.

The Committee do not bind themselves to accept the highest or any offer.

For the convenience of purchasers, this material may be sold in lots.

Offers may be addressed, under cover, sealed and endorsed "Retort Mountings," to Ralph Darlington, Esq., Town Clerk, Corporation of Wigan, on or before the 31st of January inst.; and all particulars may be obtained on application to the undersigned.

JOS. TIMMINS, Engineer, &c.

Borough Gas-Works, Wigan, Jan. 3, 1889.

CORPORATION OF BURNLEY.

THE Gas Committee of the Burnley Corporation are prepared to receive TENDERS for the purchase of the Surplus TAR and LIQUOR produced at their Works during the Twelve months commencing on the 26th of March, 1889.

The tenders for Tar and Liquor should be independent the one of the other.

Information as to probable quantity, &c., may be obtained from Mr. Saml. P. Leather, Gas-Works, Burnley.

Tenders, addressed to the Chairman of the Gas Committee, Town Hall, Burnley, to be delivered on or before Wednesday, the 30th of January, 1889.

WALTER SOUTHERN, Town Clerk.

Town Hall, Burnley, Jan. 11, 1889.

TO RETORT & FIRE-BRICK MANUFACTURERS.

THE Corporation of Birkenhead are prepared to receive TENDERS for RETORTS, FIRE-BRICKS, and FIRE-CLAY, required at their Gas-Works during the current year.

Forms of tender may be obtained from Mr. T. O. Paterson, C.E., Gas Engineer, Gas-Works, Thomas Street.

Tenders, sealed and endorsed "Tender for Retorts, &c.," to be sent in to me not later than Five o'clock in the Afternoon of Friday, the 25th of January, 1889.

The Corporation do not bind themselves to accept the lowest or any tender.

By order,

ALFRED GILL, Town Clerk.

Town Hall, Birkenhead, Jan. 8, 1889.

MERTHYR TYDFIL GAS COMPANY.

OXIDE OF IRON.

THE Committee of Directors are prepared to consider TENDERS for the supply of 50 tons of OXIDE OF IRON for Purification purposes, delivered on the Railroad Siding of the Company, at the Works.

Particulars may be obtained on application to the Manager.

Tenders, endorsed "Oxide," addressed to the undersigned, will be received up to Thursday, the 31st inst.

The lowest or any tender not necessarily accepted.

By order,

JOHN L. COCKER,
Manager and Secretary.

Gas Offices and Works,
Merthyr Tydfil, Glamorganshire,
Jan. 10, 1889.

MERTHYR TYDFIL GAS COMPANY.

SPENT OXIDE OF IRON.

THE Committee of Directors will be glad to receive OFFERS for the purchase of about 80 tons of SPENT OXIDE.

Samples and particulars may be had on application to the Manager.

Offers, endorsed "Spent Oxide," addressed to the undersigned, will be received up to Thursday, the 31st inst.

The highest or any offer not necessarily accepted.

By order,

JOHN L. COCKER,
Manager and Secretary.

Gas Offices and Works,
Merthyr Tydfil, Glamorganshire,
Jan. 10, 1889.

MILLOM LOCAL BOARD.

TENDERS are invited for the supply of 1000 tons of GAS COAL, at such times and in such quantities as the Board require during Twelve months, from the 14th of February next.

The Coal must be of best quality, and as free as possible from Bats, Pyrites, and Dross.

Full particulars of the Coal and Colliery, and an epitome of the Working Analysis, to be given.

The price per ton, delivered free at Millom Station, and (where applicable) at the nearest and most available port to the Colliery or Depôt, to be stated.

Sealed tenders (on forms which can be had on application to the undersigned), endorsed "Tender for Coal," to be sent in to me not later than the 24th of January inst.

The Board will not be bound to accept the lowest or any tender.

W. T. LAWRENCE,
Clerk to the Board.

Local Board Offices, Millom,
Jan. 9, 1889.

BRISTOL UNITED GASLIGHT COMPANY.

AMMONIACAL LIQUOR.

THE Directors of this Company invite TENDERS for the purchase of the AMMONIACAL LIQUOR to be produced at all or either of their three Stations during a period of One, Three, Five, or Seven years, commencing on the 1st day of July, 1889.

The annual quantities and strengths of the Liquor produced at each of the Stations at present are approximately as follows:—

	Gallons.	
Canons' Marsh Station,	1,000,000	of 14 ounce Strength.
Avon Street "	1,300,000	" 15 " "
Stapleton "	700,000	" 17 " "

Conditions of Contract, and forms of tender, may be obtained on application to the undersigned, to whom also tenders, sealed, and endorsed "Tender for Ammoniacal Liquor," must be delivered not later than Ten a.m. on Monday, the 28th day of January, 1889.

The Directors do not bind themselves to accept the highest or any tender.

JAS. V. GREEN, Secretary.

Chief Offices: Canons' Marsh,
Bristol, November, 1888.

NEW ROMNEY GASLIGHT AND COKE COMPANY, LIMITED.

ISSUE OF DEBENTURE BONDS.

THE above Company, in raising their new Capital, are issuing fourteen DEBENTURE BONDS of £50 each, for which TENDERS are invited.

All tenders must be in writing, and state the number of bonds the applicant is willing to take, and what rate of interest will be accepted.

New Romney, Kent. WM. ALLEN, Secretary.

TO INVENTORS AND PATENTEES.

MR. W. H. BENNETT having had considerable experience in matters connected with Gas, Water, and Sanitary Improvement, begs to say that he continues to assist Inventors in the perfection of their designs, and to obtain for them PROVISIONAL PROTECTION, whereby their Invention may be secured for Twelve months; or LETTERS PATENT, which are granted for Fourteen Years.

Patents completed, or proceeded with at any stage, thereby rendering it unnecessary for persons resident in the country to visit London.

Patents procured for Foreign Countries.

Information as to cost, &c., supplied gratuitously upon application to the Advertiser, 22, Great George Street, WESTMINSTER.

JAMES NEWTON & SONS,
(Established 1820,)
FIRE-BRICK AND TILE MERCHANTS
Wholesale and for Exportation,
FALCON DOCK, 78 AND 79, BANKSIDE,
SOUTHWARK, LONDON, S.E.
DEPÔT for STOURBRIDGE AND NEWCASTLE FIRE-BRICKS, LUMPS, TILES, and FIRE-CLAY and every Article suitable for
GAS AND WATER WORKS.

UNEQUALLED.

Gas Companies are solicited to try Samples of the

MIRFIELD

BLACK BED GAS COAL

Prices and Analysis on application.

MIRFIELD (GAS-COAL) COLLIERY COMPY.
MIRFIELD, NORMANTON.

CAST-IRON PIPES

FOR GAS AND WATER.

VALVES

FOR GAS, WATER, AND STEAM.

TELEGRAMS: "PIPES GLASGOW."

WM. MACLEOD & CO.,
56, ROBERTSON STREET, GLASGOW.

G. WALLER & Co.'s NEW PATENT GAS EXHAUSTER.

MADE WITH FOUR OR THREE BLADES.

In use at, or on order for, over **120** *Works, equal to* **4,320,000** *Cubic Feet per Hour.*

Oldest Makers of Beale Exhausters for over 300 Works and 25,6co,000 cubic feet per hour.

1,000 to 250,000 CUBIC FEET PER HOUR WITH OR WITHOUT ENGINE COMBINED.

KEEP IN STOCK NEW AND SECOND HAND:

NEW PATENT and BEALE EXHAUSTERS, with and without Engine combined, in sizes varying from 2,000 to 80,000 feet per hour.

GAS-VALVES, INSIDE AND OUTSIDE RACKS, from 2 to 24 in., from 5s. 6d. per Inch.

PATENT COMPENSATING GOVERNORS FOR STEAM THROTTLE VALVES IN THREE SIZES.

TAR and LIQUOR PUMPS, 3in. to 6in., with ECCENTRICS and RODS.

PHŒNIX STEAM, TAR, AND LIQUOR PUMPS.

Hydraulic Governors in three Sizes, and Throttle Valves 2in. to 6in.

IMPROVED ACTING BYE-PASS VALVES, 4in. to 18in. HYDRAULIC MAIN VALVES, 3in. to 12in.

Thomas and Somerville's Coke-Breakers in Four Sizes.

Phœnix Engineering Works, Park Street, Southwark, London, S.E.,

NEAR SOUTHWARK BRIDGE (FOUR MINUTES FROM HOLLAND STREET), AND AT

STROUD, GLOUCESTERSHIRE

TROTTER, HAINES, & CORBETT,
BRETTELLS' ESTATE
FIRE-CLAY & BRICK WORKS,
STOURBRIDGE.

Manufacturers of GAS-RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICK, Proprietors of BEST GLASSHOUSE POT & CRUCIBLE CLAYS

SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

ROBERT MARSHALL,
CANNEL COAL MERCHANT,
97, WELLINGTON STREET, GLASGOW.

Prices and Analysis of all the Scotch Cannels on application.

GEO. WELLER & CO.,
Consulting & Contracting Gas Engineers,
SUFFOLK HOUSE,
LAURENCE POUNTNEY HILL,
CANNON STREET, LONDON.
GAS-WORKS LEASED
On Special Terms or Guaranteed Dividends.
Contractors for the Erection of New and Remodelling of existing Gas-Works from own or Engineers' Drawings.
25 Years' experience in Gas Manufacture and Distribution in London and the Provinces.
ESTIMATES GIVEN.
Agents for Fire-Clay Goods and other Gas-Plant. Also for Foreign Gas Companies.
All Communications to be addressed to the Firm.
Telegraphic Address: "GASIFICATION, LONDON."

GAS COAL.

POPE & PEARSON, LTD.,
have now the authority of several of the most eminent Gas Engineers of London in stating that their Coal yields in practical working over 10,000 cubic feet of gas, with an illuminating power of 16 candles; or by the standard burners now used by the London Gas Companies, an illuminating power equal to 17½ candles.

One ton yields 12¼ cwt. of good coke.

This Coal can be shipped from Hull, Goole, Liverpool, Morecambe, and Barrow.

For further particulars apply to POPE AND PEARSON, LIMITED, West Riding and Silkstone Collieries, near LEEDS.

TELESCOPIC EXTENSION LADDERS & STEPS. All sizes, many patterns, large stock for all purposes, indoor and outdoor. Admirable inventions.
HEATHMAN & CO.,
2 Endell St., & 11, High St., Bloomsbury, London, W.C.

LUX'S GAS-BALANCE.
(For Description, see JOURNAL OF GAS LIGHTING, July 17, 1888.)
For the Automatic Determination of the Specific Gravity and the Composition of Gases.

Patented in Great Britain and Abroad.

SOLE AGENTS FOR THE UNITED KINGDOM:
Messrs. ALEX. WRIGHT & Co.,
55, 55a, 56, Millbank St., Westminster,
LONDON, S.W.

THOMAS ILLINGWORTH,
NORTH DEAN CHEMICAL WORKS,
Near HALIFAX,
MANUFACTURER OF SULPHURIC ACID
OF EXTRA QUALITY FOR MAKING
WHITE SULPHATE OF AMMONIA.
TAR, LIQUOR, AND SPENT OXIDE Purchased for Cash against Delivery.

THOMAS TURTON AND SONS, LIMITED,
SHEAF AND SPRING WORKS,
SHEFFIELD,
MANUFACTURERS OF
FILES OF BEST QUALITY FOR ENGINEERS.
STEEL OF ALL DESCRIPTIONS.
SCREW STOCKS, TAPS AND DIES, SPANNER RATCHET BRACES, LIFTING-JACKS, ANVILS, VICES, AND ENGINEERS' TOOLS GENERALLY.
LONDON OFFICE:
90, CANNON STREET, E.C.

THE ONLY RELIABLE
DRY CENTRE-VALVE,
WORKING ONE, TWO, THREE, OR FOUR PURIFIERS ON AT THE TIME.
ALSO MADE FOR TWO OR THREE PURIFIERS.
No Springing. No Leakage. No Foul Gas passed in Changing. Special Facility for Blowing the Air out of the Fresh Box before putting in Action, without driving it forward into the Holders.
Write for Prospectus.
ALSO DOUBLE-ACTION DOUBLE-FACED GAS & WATER VALVES.
F. WECK, 86, NEW STREET, BIRMINGHAM.

MARQUIS OF LOTHIAN'S
NEWBATTLE CANNEL.
QUOTATIONS ON APPLICATION TO
MR. JOHN MORISON,
NEWBATTLE COLLIERIES,
DALKEITH, N.B.

Awarded HIGHEST MEDAL and DIPLOMA at the Newcastle-on-Tyne Royal Mining and Industrial Exhibition, 1887, for
CANNEL & COAL.

TYNE
BOGHEAD CANNEL.
Yield of Gas per ton . . . . . 13,155 cub. ft.
Illuminating Power . . . . . 38·22 candles
Coke per ton . . . . . 1,301·88 lbs.

EAST PONTOP GAS COAL.
Yield of Gas per ton . . . . . 10,500 cub. ft.
Illuminating Power . . . . . 16·8 candles.
Coke . . . . . 70 per cent.

For Prices and complete Analysis, apply to
YOUNG, DANCE, & CO.,
COAL OWNERS, NEWCASTLE-ON-TYNE,
Or E. FOSTER & CO., 21, John St., Adelphi, LONDON, W.C.

IMPROVED EDITION, ON SUPERIOR PAPER.
SANDELL'S GAS COMPANIES' EXPENDITURE JOURNAL.
Being a Ruled Account-Book, with Printed Headings and Analyzing Guide, for Keeping (upon the easiest and most correct method) the Expenditure of a Gas Company in accordance with the provisions of the Gas-Works Clauses Act of 1871, and suitable for all Companies.

PRICES: Limp Cloth—Half Quire, 10s.; One Quire, 16s.
Half Bound, Cloth Sides—Two Quires, 36s.; Three Quires, 44s.

TO BE HAD OF THE PROJECTOR,
EDWARD SANDELL, Chartered Accountant, No. 181, Queen Victoria Street, E.C.
OR OF
WALTER KING, "Journal of Gas Lighting," 11, Bolt Court, Fleet Street, E.C.

Price 1s., Post Free. Printed on stout paper, in stiff paper cover.
By (the late) Dr. WILLIAM WALLACE, F.R.S.E., &c.
ANALYSES
OF
SCOTCH COALS, CANNEL, SPLINT, SHALE, ETC.,
Used in the Manufacture of Gas.
LONDON: WALTER KING, 11, BOLT COURT, FLEET STREET, E.C.

GOLDSMITH & DILKE'S
PATENT GAS SERVICE CLEANSER.

The patent has now expired. No licence is therefore required for using this. Cleansers (in tin case for powder and caps), as supplied to the principal Gas Undertakings, can be obtained at 3s. 6d. each from

G. GOLDSMITH,
19, OXFORD STREET, LEICESTER.

For **FIRE-BRICKS,** the most durable for **GAS-FURNACES,**
ADDRESS
JAMES WHITE & Co.,
ALBERT WORKS, WIDNES.

JAMES OAKES & CO.,
ALFRETON IRON-WORKS, DERBYSHIRE,
AND
WENLOCK IRON WHARF, 21 & 22, WHARF ROAD,
CITY ROAD, LONDON N.,
Manufacture and keep in Stock at their Works (also large stock in London)

PIPES and CONNECTIONS, 1¼ to 48 inches in diameter; and make and erect to order RETORTS, PURIFIERS, and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

NOTE.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with bolts, nuts, and covers, and rendering leakage impossible.

GAS AND WATER PIPES,
¼ to 12 IN. BORE.

THOMAS ALLAN & SONS,
SPRINGBANK IRON-WORKS,
GLASGOW;
AND BON LEA FOUNDRY,
SOUTH STOCKTON-ON-TEES.
Makers of SANITARY & RAIN PIPES, HOT WATER PIPES, STABLE FITTINGS, RANGES, STOVES And GENERAL CASTINGS.

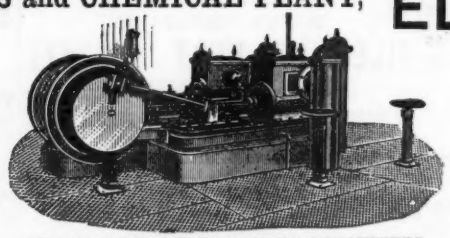
BEST
GAS COAL. REAL OLD SILKSTONE GAS COAL.
Address, THE STRAFFORD COLLIERIES COMPANY,
NEAR BARNSLEY, SOUTH YORKSHIRE.

JOHN BROWN & CO., LIMITED,
ATLAS STEEL AND IRON WORKS, SHEFFIELD,
ALDWARKE MAIN GAS COAL.
This Coal yields 12,600 feet of 19-candle gas per ton.
Weight of illuminating matter in pounds of sperm, 820·80. Very free from impurities.

LAMBERT BROS. ALPHA TUBE AND FITTING WORKS, **WALSALL**
MANUFACTURERS OF WROUGHT-IRON TUBES AND FITTINGS, BRASS GAS-FITTINGS, GAS-VALVES, STEAM AND WATER VALVES, &c.,
And of WARNER'S PATENT MARKET GAS STAND-PIPE.
LONDON: T. LAMBERT & SONS, SHORT STREET, LAMBETH, S.E.

R. DEMPSTER & SONS, LIMITED.,
MANUFACTURERS of GAS and CHEMICAL PLANT, ELLAND, YORKS.

VALVES OF ALL DESCRIPTIONS AND FOR ALL PURPOSES.
LARGE STOCK KEPT.



DIRECT-ACTING RECIPROCATING EXHAUSTERS.

ALL VALVES TESTED TO 40lbs. AND FLANGES FACED.
Prompt delivery guaranteed.
MAKERS OF LIVESEY'S PATENT WASHERS FOR THE COLONIES AND ABROAD.

D. HULETT & CO. Invite attention to the following Specialities:—
PATENT STREET LAMPS,
NO PUTTY OR OTHER MATERIALS ARE REQUIRED TO SECURE THE GLASS. PRICE 9s. 9d. EACH NET.
D. Hulett's Improved Service Cleanser, for the removal of Naphthalene and other obstructions in Service-Pipes, Price 70s. net.
IMPROVED HIGH-POWER LANTERNS; PRICES ON APPLICATION.
Patentees of Improved Wet and Dry Gas-Meters.
Makers of Pressure-Gauges, Gaseliers, and every kind of Gas-Fittings for the Trade.
SHOW-ROOM AND WORKS: 55 & 56, HIGH HOLBORN, LONDON.

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THOMAS SPITTLE, LTD.
[ESTABLISHED OVER 50 YEARS.]
CAMBRIAN FOUNDRY, NEWPORT, MON.,
MAKERS OF
CAST-IRON PIPES FOR GAS, WATER, AND STEAM
ALSO
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ALSO ALL WROUGHT-IRON WORK.
THE LARGEST MAKERS IN WALES

ELLIS LEVER & Co.

ARE PREPARED TO SUPPLY

GAS COMPANIES

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WITH

GAS COAL & CANNEL

OF THE BEST QUALITIES.

Prices and Analyses on Application.

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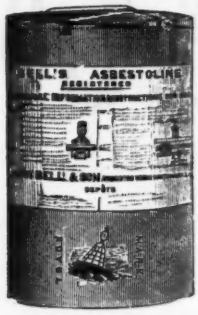
BELL'S ASBESTOLINE.

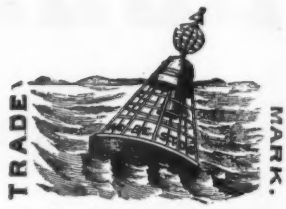
REGISTERED.



All kegs are labelled as above.

ADVANTAGES OF ASBESTOLINE.

ASBESTOLINE is the most efficient Lubricant for all bearings.
ASBESTOLINE is the cheapest Lubricant.
ASBESTOLINE saves from 50 to 90 per cent. of the Cost of Oil.
ASBESTOLINE is the Cheapest Lubricant.
ASBESTOLINE is favoured by Insurance Companies.
ASBESTOLINE is the most Inodorous Lubricant.
ASBESTOLINE is the safest Lubricant from Ignition.
ASBESTOLINE has beaten all other Lubricants in trials.
ASBESTOLINE is applicable in and out doors in every Climate.
ASBESTOLINE requires no special application.



BELL'S ASBESTOS.

CONSISTENCY OF ASBESTOLINE.

ASBESTOLINE, to meet all circumstances, is made in four degrees of consistency—A, B, C, and CC.

ASBESTOLINE, A, is specially adapted to ordinary Land Engines and Machinery, in and out door, in this country.

ASBESTOLINE, B, a little more solid, is for use on Steamships in temperate climates, also on land when it is desirable to have Lubricant stiffer than A.

ASBESTOLINE, C, is for use in tropical climates, both ashore and afloat. It is also invaluable in works in this country when the temperature is high.

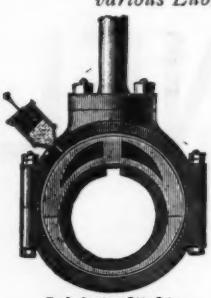
ASBESTOLINE, CC, is designed for use on Calenders, Paper-Machines, &c., where the bearings are heated by steam passing through, and sometimes is advantageously used instead of C.

The reputation of Asbestoline as a Lubricant of the highest efficiency in every kind of Machinery is established; and it has never been equalled by any other Lubricant in the numerous cases of special difficulty in which the best oils are ineffectual. It is used with marked success in Steel and Iron Works, Collieries, Cotton and Wool Mills, and other Textile Manufactories. In Corn-Mills it has proved invaluable on the roller and other modern machines. In Saw-Mills, on machines going up to 5000 revolutions per minute, its work has never been approached by any other Lubricant On Electric Lighting Machinery, and in Steamships of all sizes through out the world, the success of Asbestoline is unequalled. Many engines and machines of all descriptions give trouble, and show bad results both in working and wear, when the system of lubrication has not received due consideration. Engineering firms of the highest standing have given to it their powerful testimony and support.

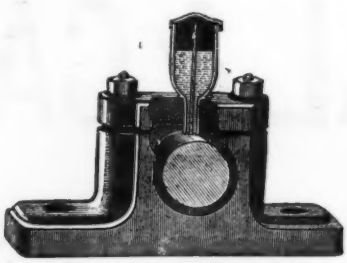
Supplied in Kegs, 28, 56, or 112 lb. Price, 2/3 per lb. Kegs Free. Special Terms for Large Quantities.

IMPORTANT TO EXPORT MERCHANTS.—*One pound of "Asbestoline" equals 2 gallons of Oil weighing 18lbs.; consequently the saving in freight is very considerable. Liberal Terms are conceded to Export Merchants.*

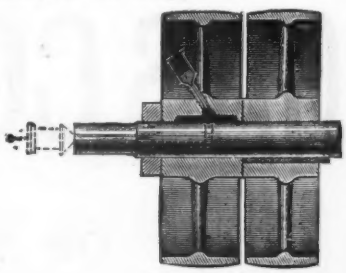
Below will be found illustrations of the mode of fixing Lubricators for Asbestoline to bearings. Full particulars of the various Lubricators supplied for Asbestoline, and the manner of fitting, in catalogue free on application.



Lubricator fitted to Eccentric of Vertical Engine



Showing Section of Lubricator fitted to ordinary Bearings.



Lubricator in different position for Loose Pulleys.

THE ATTENTION OF

ENGINEERS, AND ALL USERS OF STEAM POWER AND MACHINERY,

IS SPECIALLY INVITED TO THE FOLLOWING REPORT.

Owing to the number of Greases now offered, samples of BELL'S ASBESTOLINE were submitted to Otto Hehner, Esq., for analysis, and the subjoined Report fully proves BELL'S ASBESTOLINE to be the safest as well as the best Lubricant for all purposes:—

The Laboratory, 11, *Billiter Square, E.C., London, May* 3, 1888.

I have subjected a sample of Bell's Asbestoline taken from the stores of Messrs. J. Bell and Son, in Southwark Street, to a number of tests, in order to ascertain whether its use in Mills or Factories might contribute to the danger from Fire.

I found that Asbestoline **ignites only with the greatest difficulty** when brought into contact with flame; that wood and other combustible material soaked in Asbestoline burns, if anything, with greater difficulty than by itself; that **its flashing point is so high that it lies beyond the range of Mercurial Thermometers**; and that consequently no friction obtainable in the ordinary run of machinery is capable of developing inflammable vapours from it.

Bell's Asbestoline is **as absolutely safe a Lubricant as can be desired or obtainable.** In the case of fire breaking out from any cause, it does not assist the conflagration; and it is **quite incapable of leading to spontaneous combustion,** either by itself or in contact with inflammable material.

From the physical nature of Asbestoline its use is of necessity perfectly clean and free from waste.

(Signed) OTTO HEHNER, Public Analyst.

Illustrated Priced Catalogue, with numerous Testimonials by Leading Firms, free on application.

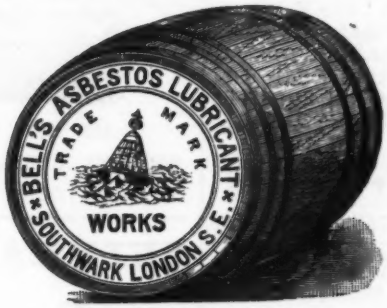
BELL'S ASBESTOS COMPANY, LIMITED,

DEPOTS—MANCHESTER: Victoria Buildings, Deansgate. LIVERPOOL: 2, Strand Street, James Street.

BELL'S ASBESTOS LUBRICANT.

(REGISTERED.)

All Drums marked as above.



Every Cask is sent out as above.

All Corks are sealed as above.

Any Customer receiving Oil sold as Bell's Asbestos Lubricant, and Cask, Drum or Corks not marked as above, is earnestly requested to forward us sample and particulars of where obtained.

The following Oils, refined and prepared by our Asbestos process, are specially recommended to Users of Machinery of every kind in all parts of the world. We guarantee the quality of each to be unequalled at the price for the purpose named, and a Sample Drum, containing 5 gallons of each or any sort, will be sent on approval to any respectable firm in any part of the world :—

BELL'S SPECIAL GAS-ENGINE OIL.—This oil is guaranteed to stand flame temperature, and is suitable for light Machinery and Shafting where gas power is used.
Price **2s. 9d.** per gallon.

1a.—BELL'S SPECIALLY PURIFIED DARK CYLINDER AND VALVE OIL.—This oil is guaranteed not to gum, corrode, or in any way injure metal surfaces. It will not carbonize, nor leave any deposit whatever in cylinders or condensers, nor will it injure india-rubber valves. It is absolutely pure hydrocarbon, and will work admirably in all good Sight-feed Lubricators.
Price **3s. 9d.** per gallon.

2a.—Bell's Specially Refined and Purified Pale Cylinder and Valve Oil contains the same properties as 1a, and is one of the very best Oils of the Valvoline class in the market.
Price **4s. 6d.** per gallon.

BELL'S PALE COMPOUND MACHINERY AND ENGINE OIL FOR EXTERNAL LUBRICATION ONLY.

"3c."—For small and medium-sized Engines, Shafting, and quick-running Machinery, displacing Lard Oil. Price **2s. 6d.** per gallon.

"3c. Special."—Heavier bodied than "3c.," and suitable for Locos. and Stationary Engines up to 300-H.P., displacing Olive Oil.
Price **2s. 9d.** per gallon.

"3c. Marine."—Much heavier than "3c.;" suitable for Marine Engines and heaviest Stationary Engines, Shafting, &c., displacing Castor Oil. Price **3s.** per gallon.

BELL'S AGRICULTURAL MACHINE OIL, for Traction Engines, Road Rollers, and all Machines working out of doors. This Oil will not set on bright parts, is not affected by extreme cold or the rays of the sun. Price **2s. 9d.** per gallon.

For other Qualities and Prices, with Testimonials, see Catalogue, free on application.

BELL'S ASBESTOS

EXPANSION SHEETING.

SECTION OF SHEETING.
PATENT No. 640, 1884.

The above, which can only be obtained from this house, is recognized as the Most Efficient and Economical Jointing Material in use. It is composed of a specially prepared India-rubber Compound, protected by a covering of Vulcanized Asbestos Sheeting, as shown above, and as it is the only Jointing Material which adequately combines PERMANENT ELASTICITY WITH HEAT RESISTANCE, the advantage it possesses will at once be seen.

EXPANSION RINGS.

The centre from which the requisite elasticity is obtained will adapt itself to uneven surfaces to which it may be applied, and allow expansion and contraction to be fully taken up. The covering, being of Asbestos Cloth, imparts a protection to the centre, and so prolongs its elasticity. For Manhole, Mudhole, Steam-Pipe, and Mash-Tun Door Joints it is unequalled; and if applied as directed, a ring can be used many times over.

BELL'S ASBESTOS.

Price **6s.** per lb. in Sheets. Rings made up to Template, **9s.** per lb.

Made from 1-Ply for Cylinder and Faced Joints to any thickness for Uneven Surfaces.

Illustrated Priced Catalogues, with numerous Testimonials from Leading Firms, free on application.

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CARDIFF: West Bute St. BIRMINGHAM: 7, John Bright St. HULL: Humber Dock Basin. GLASGOW: 35, Robertson St.

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NEW HIGH-POWER GAS-LAMP, WESTPHAL'S PATENT.
MOST INTENSE WHITE BRILLIANT GAS LIGHT.
MOST ECONOMICAL, SIMPLE, AND DURABLE.
DOES NOT GET OUT OF ORDER.
RIVALS THE ELECTRIC LIGHT.
NO ALTERATION REQUIRED TO EXISTING FITTINGS.
BURNER, BEING A CIRCULAR SLIT, DOES NOT CHOKE UP.

PARTICULARS & PRICES POST FREE.

HENRY GREENE & SONS,
SOLE CONSIGNEES FOR GT. BRITAIN & COLONIES,
153 TO 155, CANNON STREET,
LONDON BRIDGE, E.C.

WILLIAM INGHAM & SONS,

WORTLEY FIRE-CLAY WORKS,
Near LEEDS,

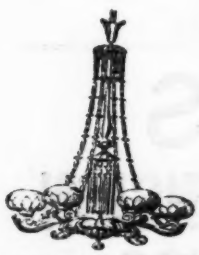
Have confidence in drawing the special attention of GAS ENGINEERS to the following advantages of their Retorts:—

1. Smooth interior, preventing Adhesion of Carbon.
2. They can be made in one piece up to 10 feet long.
3. Uniformity in thickness, ensuring equal Expansion and Contraction.

PATENT
MACHINE-MADE GAS-RETORTS.

F. & C. OSLER,

(ESTABLISHED 1807)



MANUFACTURERS OF CRYSTAL GLASS CHANDELIERS,
WALL LIGHTS, AND LUSTRES FOR GAS AND CANDLES,
TABLE GLASS OF ALL KINDS,
CHANDELIERS IN BRONZE AND ORMOLU.
MODERATOR LAMPS.

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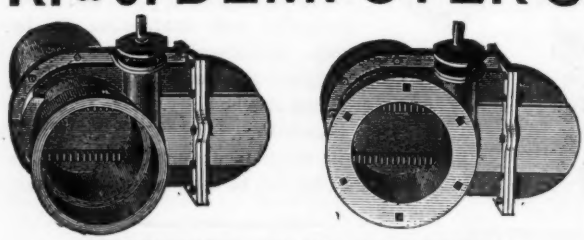
MANUFACTORY AND SHOW-ROOMS:
BROAD STREET, BIRMINGHAM.

R. & J. DEMPSTER'S



TESTED GAS-VALVES.

The pinions of all our Slide Valves are now cut by special machinery from solid forgings. Valves of 10-in. bore and upwards are fitted with double racks, without extra charge. The flanges are all faced and made to standard dimensions, unless otherwise ordered. All valves are tested and guaranteed tight before leaving the works.

Upwards of 200 Valves kept in stock to facilitate quick delivery.

Prices and Dimension Lists sent on application.

All kinds of Faced and Hydraulic Centre and other Valves made to order.

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JOHN HALL & CO.,

STOURBRIDGE,

MANUFACTURERS OF FIRE-BRICKS, LUMPS, TILES,

AND EVERY DESCRIPTION OF FIRE-CLAY GOODS.
RETORTS CAREFULLY PACKED FOR SHIPMENT.
A STOCK OF DIFFERENT SHAPES ON HAND.

SULPHATE OF AMMONIA.

By Her Majesty's Royal Letters Patent.

DR. FELDMANN'S APPARATUS

The most successful and approved Apparatus known up to the present time.

FOR REFERENCES, PARTICULARS, TESTIMONIALS, AND PRICES APPLY TO THE

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GODDARD, MASSEY, & WARNER, ENGINEERS,
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OR TO
The Sole Agent,
MAURICE SCHWAB,
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MANUFACTURED BY THE

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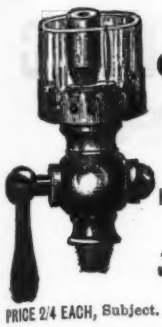
BURNER LIGHTING TAP

(MACFIE'S PATENT)

SURPASSES ALL OTHERS.



NEW PATTERN WITH

GLASS LANTERN

Price 2/4, Subject.

WITH BRASS GLOBE,

Price 2/-, Subject.

ROUND HOLDERS TO FIT, 4d.

CAST COMET HOLDERS, 1s.

SOLE MAKERS—

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ESTABLISHED 100 YEARS.

THE LARGEST

SULPHATE PLANT MANUFACTURERS

IN THE TRADE.

The present Low Prices render it absolutely necessary for Gas Engineers to use the commonest Pyrites Acid, and obtain the whitest and best quality of Sulphate, so as to obtain a better price and more ready market.

For this purpose they strongly recommend the

NEW IMPROVEMENTS

Combined with their

PATENT SAFETY CLOSED SATURATORS

Improved Self-acting and Steam Liming Process

Under pressure, effecting a considerable Saving in Time in Working off the Contents of each Still.

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IN OPERATION.

A number of Plants on the Open System recently remodelled with greatly improved results.

GAS AND WATER PIPES, HYDRAULIC CRANES, CAPSTANS, BOILERS, ROOFS, TANKS, &c.

Messrs. ABBOT & Co. (Works at Gateshead-on-Tyne) employ 2000 men, including several experienced Plumbers, to erect New and remodel Old Sulphate Plants.

Applications to be made to the

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SUFFOLK HOUSE, CANNON STREET, E.C

THE THAMES BANK IRON CO.

UPPER GROUND STREET, LONDON, S.E.,

SUPPLY FROM STOCK

CAST-IRON RETORTS

AND ALL KINDS OF GAS-WORKS APPARATUS.

SOCKET-PIPES FOR GAS OR WATER PURPOSES.

FLANGE PIPES FOR STEAM.

Sole Manufacturers of LYON'S 'PATENT' GAS MAIN SYPHONS

CLAYTON, SON, & CO.

ESTABLISHED A QUARTER OF A CENTURY. LIMITED.

MANUFACTURERS OF ALL KINDS OF

GASHOLDERS

AND

GAS PLANT

OF EVERY DESCRIPTION.

LONDON OFFICE: 63, QUEEN VICTORIA STREET, E.C.

HUNSLET, LEEDS.

S. PONTIFEX & CO.,

GAS and WATER ENGINEERS

Manufacturers of and Contractors for the Maintenance of

PUBLIC LAMPS & LANTERNS;

GLASS—Flint, Opal, and Bent in Stock, and Cut to Sizes

WELL LAMPS, STREET NAME TABLETS,

LAMP COLUMNS, HEAD IRONS, PUTTYLESS LAMPS

LANTERN COCKS, REGULATORS,

Improved High-Power Lanterns for Lighting Street Refuges and Open Spaces.

BROWN'S PATENT

LAMPLIGHTERS' TORCHES.

PROPRIETORS AND MANUFACTURERS OF

BOX'S PATENT

PUTTYLESS STREET LAMP.

This Lamp may be supplied fitted with clear opal, or ribbed glass, *as also with enamel tops* if required. The necessary fittings for altering existing Lamps to this system can be supplied at moderate prices.

S. PONTIFEX & CO., 22, COLEMAN ST., LONDON.

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JOSEPH CLIFF AND SONS,

THE ORIGINAL (ESTABLISHED 1795).

WORTLEY FIRE-BRICK WORKS,

NEAR LEEDS.

SPECIAL NOTICE.—Our Patent Machine-Made Retorts have now been thoroughly tested, and have proved themselves infinitely superior to those made by hand. At several large works it has been settled, beyond question, that, owing to the compactness and general excellence, more gas is sent to the gasholder from each ton of coal carbonized than is the case with hand-made Retorts.

AT THE PARIS EXHIBITION, 1878,

THREE MEDALS AND HONOURABLE MENTION

WERE AWARDED TO

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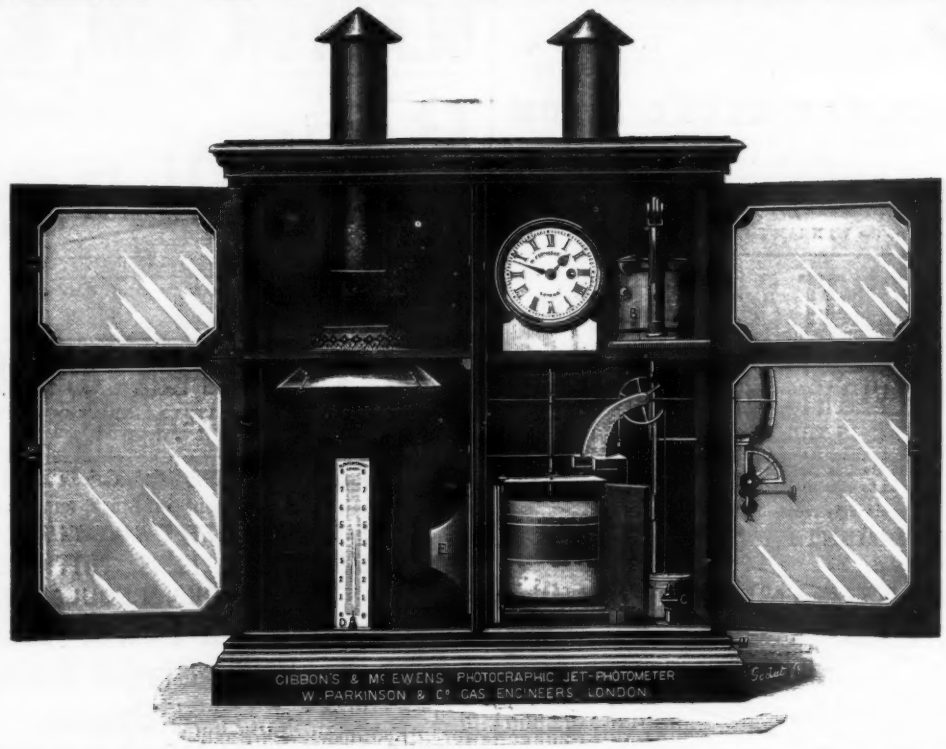
For their Various Exhibits, amongst which is a

SILVER MEDAL FOR THEIR PATENT MACHINE-MADE RETORTS AND FIRE-BRICKS,

Being the Highest Honour given for this Class.

London Wharf: No. 4, inside Great Northern Goods Station, King's Cross, N. Liverpool: Leeds Street.

GIBBONS & McEWEN'S
PATENT
SELF-REGISTERING PHOTOGRAPHIC
JET PHOTOMETER.



THIS Instrument is designed to photograph continuously the Illuminating Power of Coal Gas, and have the same recorded upon sensitized paper, which records can be kept for future reference as to the actual Illuminating Power of the Gas sent out upon any date and time.

It is a very unique and handsome looking Apparatus, beautifully mounted, containing very sensitive Governor, with Brass Beam, Adjuster and Brass Pillar, Eight-Day Clock, and mechanism for turning Drum, King's Gauge with Bracket, Wheel, Adjustable Pointer and Scale, Camera Box of Polished Mahogany, with Guides and adjustable Illuminating Power Line, &c., Graduated Glasses, Ruby and Opal, with Gallery and Burner, Copper Chimneys for air currents, Opal Shade, and all Fittings in Burnished Brass. The Micrometer Cock and Scale for King's Gauge are enclosed in a Box with Glass Front on side of Case, with Lock and Key.

FULL PARTICULARS AND PRICE ON APPLICATION TO

W. PARKINSON & CO., GAS ENGINEERS, COTTAGE LANE WORKS, CITY ROAD, LONDON.

Telegraphic Address: "INDEX LONDON." [See also Advt. p. 104.

London: Printed by WALTER KING (at the office of King, Sell, and Railton, Ltd., 12, Gough Square); and published by him at No. 11, Bolt Court, Fleet Street, in the City of London.—Tuesday, Jan. 15 1889.